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BULLETIN No. 106-2

GROUND WATER OCCURRENCE AND QUALITY: SAN DIEGO REGION

Volume I: Text



JUNE 1967

RONALD REAGAN

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GROUND WATER OCCURRENCE AND QUALITY, SAN DIEGO REGION

VOLUME I: TEXT

Page 75, paragraph 2, last sentence	NOW READS	SHOULD READ
	Their major chemical constituents are the oxides of silicon, aluminum, iron, calcium, sodium, and potassium.	Their major chemical constituents are the oxides of silicon, aluminum, iron, calcium, sodium, <i>magnesium</i> , and potassium.
Page 75, paragraph 6, last line	Clayey materials, and other complex physiochemical processes	Clayey materials, and other complex <i>physicochemical</i> processes.
Page 78, paragraph 3, (conversion factors)	$\frac{\text{Ca}}{\text{CaO}} = 0.7146; \quad \frac{\text{Mg}}{\text{MgO}} = 0.6032;$ $\frac{\text{Na}}{\text{Na}_2\text{O}} = 0.7419 \text{ and } \frac{\text{K}}{\text{K}_2\text{O}} = 0.8320$	$\frac{\text{Ca}}{\text{CaO}} = 0.7146; \quad \frac{\text{Mg}}{\text{MgO}} = 0.6032;$ $\frac{2 \text{ Na}}{\text{Na}_2\text{O}} = 0.7419 \text{ and } \frac{2 \text{ K}}{\text{K}_2\text{O}} = 0.8320$
Page 150, "Industrial Waste", lines 2 and 3	"any and all liquid or solid water substances, not sewage, from any producing, manufacturing or processing operation of whatever nature."	"any and all liquid or solid <i>waste</i> substance, not sewage, from any producing, manufacturing or processing operation of whatever nature."

VOLUME II: PLATES

Plate II A

All areas where "inferred Mg Cl" is indicated should show "inferred Na Cl" instead, except for:

1. Area immediately surrounding Fallbrook (in left center of map) which is correct in showing "inferred Mg Cl."
2. Area along the coast between Las Flores Mission and Camp Del Mar which is also correct in showing "inferred Mg Cl."
3. Area just to the right of Pala, along Highway 76, which should show "inferred Ca SO₄."



The Study Area,
from Orbiting Gemini V Spacecraft,
August 1965

National Aeronautics and
Space Administration

The San Diego Region is located in the southwesternmost part
of California. (Shown is Los Angeles to Baja California with
San Clemente Island in foreground and Salton Sea in background.)

STATE OF CALIFORNIA
The Resources Agency
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RONALD REAGAN
Governor
State of California

WILLIAM R. GIANELLI
Director
Department of Water Resources

FOREWORD

Bulletin No. 106-2, "Ground Water Occurrence and Quality, San Diego Region", culminates an intensive 2-year investigation of most of San Diego County, and limited portions of Riverside and Orange Counties.

This study authorized under Section 12616, Chapter 1, of the State Water Code, is the second of two reports in the Bulletin No. 106 series. The first, Bulletin No. 106-1, "Ground Water Occurrence and Quality, Lahontan Region", was published in June 1964. These investigations, because of their broad scope and vast areal extent were, by necessity, of a general nature.

The San Diego Region was selected for investigation because the surface and ground water monitoring program of the Department had indicated the existence of water quality problems of various origins.

In this investigation, the geohydrochemical approach was used to evaluate existing conditions: that is, a study was made of the chemical quality of surface and ground water as it is influenced by the geologic and hydrologic environments and modified by man's activities.

Therefore, geologic, hydrologic, and water quality studies were made of the 11 hydrologic units within the San Diego Drainage Province. Ground waters in each of these units were analyzed and classified as to their suitability for domestic and irrigation uses. Existing sources of ground water impairment were also noted because this information will serve as a basis for discerning water quality trends.

The availability of an adequate supply of water of a quality suitable for beneficial uses is a prime factor in the future cultural development and growth in the San Diego Region. This report is designed to bring into sharper focus some of the water quality problems that must be overcome if ground water is to contribute to such growth.

William R. Gianelli

William R. Gianelli, Director
Department of Water Resources
The Resources Agency
State of California

April 13, 1967

TABLE OF CONTENTS

	<u>Page</u>
FOREWORD	iii
ORGANIZATION	x
ENGINEERING CERTIFICATION	xi
ACKNOWLEDGMENT	xii
AUTHORIZATION	xiii
ABSTRACT	xiv
 CHAPTER I. INTRODUCTION	 1
Objectives of Investigation	1
Scope of Investigation	1
Area of Investigation	2
Topography	2
Climate	3
Cultural Development	3
Agriculture	4
Urban and Suburban	5
Mining	7
Presentation in Report	7
Findings	9
Conclusions	11
 CHAPTER II. GEOLOGY	 13
Geologic History	13
Physiography	16
Coastal Plain Section	18
Mountain-Valley Section	18
Central Mountain-Valley Area	19
Eastern Mountain-Valley Area	21
Soil Characteristics	22
Geologic Rock Types	23
Alluvium	23
Residuum	23
Pleistocene Sediments	30
Pre-Quaternary Sediments and Volcanic Rocks	30
Crystalline Rocks	33
Granodiorites	33
Tonalites	34
Gabbros and Diorites	35

	<u>Page</u>
Metamorphic Rocks	36
Structural Geology	36
CHAPTER III. WATER SUPPLY	39
Present Sources of Supply	39
Precipitation and Surface Water	41
Ground Water	43
Occurrence	44
Alluvium and Pleistocene Sediments	45
Pre-Quaternary Sediments	47
Crystalline Rocks and Residuum	47
Water Levels	49
Well Production	51
Imported Water	52
Potential Sources of Supply	56
CHAPTER IV. WATER QUALITY	59
Chemical Constituents and Properties	59
Calcium (Ca)	59
Magnesium (Mg)	60
Sodium (Na) and Potassium (K)	61
Carbonate (CO_3) and Bicarbonate (HCO_3)	61
Sulfate (SO_4)	61
Chloride (Cl)	62
Nitrate (NO_3)	62
Boron (B)	62
Electrical Conductivity (EC)	63
Total Dissolved Solids (TDS)	63
Radioactivity	63
Chemical Character	65
Quality Criteria	65
General Criteria	65
Domestic and Municipal Use	67
Irrigation Use	69
Specific Criteria	70
CHAPTER V. GEOHYDROCHEMISTRY	73
Effects of Precipitation and Runoff	73
Effects of Geologic Environment	74
Factors Influencing Water Quality	74

	<u>Page</u>
Weathering and Rock Composition	74
Hot Springs	76
Techniques Utilized in Evaluating Effects	77
Evaluation of Effects	84
Sedimentary Rocks	86
Pala Fanglomerate	86
Temecula Arkose	86
San Diego Formation	87
Capistrano and San Mateo Formations	87
Poway Conglomerate	87
La Jolla Formation	88
Crystalline Rocks	88
Granodiorite	88
Tonalite	89
Gabbro	89
Metamorphic Rocks	90
Effects of Man's Activities	90
Sources of Ground Water Impairment	91
Sea Water	91
Connate Waters	92
Hot Springs	92
Adverse Salt Balance	93
Industrial and Domestic Wastes	94
Boron	94
Hexavalent Chromium	94
Water Softener Regeneration Brines	95
Nitrates	95
Alkyl Benzene Sulfonate (ABS)	95
Chemical Fertilizers	95
Influences of Supplemental Waters	96
Colorado River Water	96
Northern California Water	97
Reclaimed Waste Water	97
Desalinized Water	98
CHAPTER VI. WATER RESOURCES OF THE HYDROLOGIC UNITS	99
San Juan Hydrologic Unit (Z-01.00)	99
Santa Margarita Hydrologic Unit (Z-02.00)	113
San Luis Rey Hydrologic Unit (Z-03.00)	115
Carlsbad Hydrologic Unit (Z-04.00)	118
San Dieguito Hydrologic Unit (Z-05.00)	120
Penasquitos Hydrologic Unit (Z-06.00)	123
San Diego Hydrologic Unit (Z-07.00)	125
Coronado Hydrologic Unit (Z-08.00)	128
Sweetwater Hydrologic Unit (Z-09.00)	129
Otay Hydrologic Unit (Z-10.00)	132
Tia Juana Hydrologic Unit (Z-11.00)	134

APPENDIXES

Appendixes

Appendix A: Selected References	137
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	<u>Page</u>
<u>Appendixes</u>	
Appendix B: Definition of Terms as Used in this Report	147
Appendix C: State Well Numbering System	153
Appendix D: Chemical Analyses of Ground Water from Selected Wells	157

ILLUSTRATIONS

	<u>Page</u>
Mount Palomar Observatory*	Front Cover
The Study Area From Orbiting Gemini V Spacecraft, August 1965	Frontispiece
Irrigated Agriculture near Fallbrook, 1963	3
San Diego, 1917 and 1963	8
Physiography of the San Diego Region	14
Looking Toward North Bank of Bed of San Diego River, November 1960	17
Escondido and Vicinity, 1962	19
Felsenmeer on Mount Woodson, November 1954	20
Outcrops of Water-Bearing Rocks	28
Core Stones and Residuum	28
Pala Fanglomerate	28
Temecula Arkose	29
San Diego Formation	29
Poway Conglomerate	32
La Jolla Formation	32
Core Stones	35
Barrett Dam and Reservoir, November 15, 1937	45
Small Well with Pressure Tank	46
Construction of Second Barrel of First Aqueduct, 1953	53
Santee Project, May 1965	55
Point Loma Desalinizing Plant, March 1962	57
Sampling Ground Water from Pressurized Well System	60
San Juan Creek Drainage System in Unit 1, January 1966	112
Northwest from Radec Toward Vail Lake in Unit 2, January 1966	114
Elsinore Fault Zone Transversing Unit 3, January 1966	117
Batiquitos Lagoon Formed at the Mouth of San Marcos Creek in Unit 4, January 1962	119
Del Mar in Unit 5, January 1966	122
La Jolla in Unit 6, January 1966	124

*Courtesy of California Institute of Technology.

	<u>Page</u>
<u>Illustrations</u>	
El Capitan Reservoir in Unit 7, January 1966	127
National City, Looking East to San Diego, in Unit 8, January 1966	129
Looking East from Alpine in Unit 9, January 1962	131
Lower Otay Reservoir in Unit 10, January 1966	133
Laguna Mountains, Summit of Unit 11, January 1966	135

FIGURES

<u>Figure Number</u>		<u>Page</u>
1	Irrigated Agriculture in San Diego Region	5
2	Population in San Diego Region	6
3	Direction of Drainage Lines in San Diego Region	38
4	Representative Precipitation Characteristics for San Diego.	40
5	Representative Runoff Characteristics, Santa Ysabel Creek at Sutherland Dam	42
6	Hydrographs of Ground Water at Selected Wells in the San Diego Region	50
7	Rate of Initial Well Production from Selected Sources	52
8A	Trilinear Diagrams Showing Chemical Relationship Between Pleistocene Sediments and Extracted Water	79
8B	Trilinear Diagrams Showing Chemical Relationship Between Pre-Quaternary Sediments and Extracted Water	80
8C	Trilinear Diagrams Showing Chemical Relationship Between Crystalline Rocks and Extracted Water	82
9	Total Dissolved Solids in Ground Water from Major Rock Types	85

TABLES

<u>Table Number</u>		<u>Page</u>
1	Lithologic Correlations in the San Diego Region	24
2	Estimated Annual Runoff at Selected Stations in the San Diego Region for 1944-45 through 1963-64	43
3	Water in Storage in Major Reservoirs in the San Diego Region	44
4	Estimated Local and Imported Water in Production in the San Diego Region	54
5	Radioassays of Surface Water from Selected Stations in the San Diego Region	64

Table
Number

6	United States Public Health Service Drinking Water Standards, 1962	66
7	Criteria for Irrigation Waters	69
8	Rating of Water for Domestic and Irrigation Uses	71
9	Increase in Chemical Concentrations Resulting from Domestic Uses	98
10	Description of Hydrologic Subunits	100

PLATES

Plate
Number

1	Location of Hydrologic Boundaries.
2A, B, C	Areal Geology.
3A, B, C	Subsurface Lithology of Selected Areas.
4A, B, C	Lines of Equal Thickness of Valley Fill in Selected Areas.
5	Lines of Equal Mean Annual Precipitation 1897-98 through 1946-47.
6A, B, C	Location of Selected Wells and Springs.
7	Lines of Equal Elevation of Water in Wells in Selected Areas.
8A, B, C	Generalized Depths to Water in Wells.
9A, B, C	Areal Extent of Total Dissolved Solids in Ground Water.
10	Chemical Quality of Water from Selected Streams, Lakes, and Reservoirs.
11A, B, C	Chemical Character of Ground Water.
12A, B, C	Rating of Ground Water for Domestic Uses.
13A, B, C	Rating of Ground Water for Irrigation Uses.

(Plates 1, 4A, 4B, 4C, 5, 7, and 10 are bound at back of this volume. Other plates are in Volume II.)

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

RONALD REAGAN, Governor, State of California
WILLIAM R. GIANELLI, Director, Department of Water Resources

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State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

ENGINEERING CERTIFICATION


This report has been prepared under my direction as the professional engineer in direct responsible charge of the work, in accordance with the provisions of the Civil and Professional Engineers' Act of the State of California.


Registered Civil Engineer

Registration No. C 5592

Date Mar 6, 1967

ATTEST:


District Engineer
Southern District

Registration No. C 6500

Date Mar 7 1967

ACKNOWLEDGMENT

Valuable assistance and data used in this investigation were contributed by agencies of the Federal government and of the State of California and by cities, counties, public water districts, and private companies, and individuals. Their cooperation is gratefully acknowledged.

Special mention is made of the cooperation of the following:

California Department of Conservation, Division of Forestry

California Department of Conservation, Division of Mines and
Geology

California Department of Public Works, Division of Highways

California Institute of Technology

Mr. Josef Callison

Dr. Richard Merriam, Geology Department, Univeristy of
Southern California

National Aeronautics and Space Administration

Orange County Planning Department

Riverside County Planning Commission

City of San Diego

San Diego County Department of Public Health

San Diego County Planning Department

San Diego County Water Authority

San Diego Regional Water Quality Control Board (No. 9)

San Diego State College, Geology Department

Santee County Water District

Title Insurance and Trust Company, San Diego

United States Department of Agriculture, Soil Conservation
Service

United States Geological Survey

AUTHORIZATION

The Department of Water Resources has undertaken this investigation as part of the continuing evaluation of the surface and ground water quality problems in Southern California. Section 12616, Article 5, Chapter 1, Part 6, Division 6 of the California Water Code authorized the Department to conduct these investigations:

"The department may conduct investigations of the water resources of the State, formulate plans for the control, conservation, protection, and utilization of such water resources, including solutions for the water problems of each portion of the State as deemed expedient and economically feasible, and may render reports thereon. In conducting such investigations and formulating such plans, the department may conduct investigations and surveys to determine the availability, usability, extents, and boundaries of underground basins."

In addition, this investigation of the ground water resources of the San Diego Region has been made in support of the activities of the San Diego Regional Water Quality Control Board (No. 9), and the many local water districts, agencies, water purveyors, and private citizens who have a direct and very real interest in the Region's water resources.

ABSTRACT

The San Diego Region, with a 1965 population of more than 1,200,000 persons largely centered in metropolitan San Diego, is a vast mountain and valley expanse of 3,900 square miles. With increasing development of the Region and a sustained drought, the water supply problem and its apparent consequences became matters of concern. To meet the water needs of the populace, it was necessary, beginning in 1947, to import Colorado River water. / Prior to that, reservoir releases and sustained heavy extractions of ground water were required in the populated coastal and developed inland areas. This pumping resulted in the impairment of the ground water quality by accelerating the lowering of water levels, which led to the intrusion of sea water and the migration of connates into the ground water reservoirs. / Chemical characteristics of ground water in alluvium and residuum throughout much of the Region are highly variable and depend largely on the watershed environment and local conditions resulting from man's activities. The effects of man's activities are particularly far-reaching where there have been heavy ground water extractions accompanied by a deficiency of precipitation and, consequently, little ground water movement to recharge and flush out the water-bearing materials. The use of supplemental waters by man to sustain his presence in the Region has also modified the chemical quality of the native ground water. / In the inland portions of the Region, native waters associated with continental Pleistocene sediments and with crystalline rocks tend to be sodium to calcium bicarbonate in character. These waters generally have a total dissolved solids concentration of less than 600 parts per million. Waters associated with the more basic crystalline rocks, such as the gabbros, are relatively rich in magnesium. / In the coastal portion, pre-Quaternary sediments, where water bearing, contain waters having a total dissolved solids content that generally falls within a range of 400 to 2,000 parts per million. Sodium and chloride ions generally predominate in association with calcium and bicarbonate ions. / Plates and figures depict geologic, hydrologic, and water quality findings and relationships.

CHAPTER I. INTRODUCTION

The spectacular growth of the San Diego Region, especially the area centered around the City of San Diego, has brought an equally rapid increase in the demand for water. During the past several years, ground water storage in some areas has been virtually exhausted, making large portions of the Region almost fully dependent on imported Colorado River water. In fact, during the period July 1, 1963 through June 30, 1964, about 80 percent of the Region's needs were met by imported water.

Although low precipitation and lack of extensive ground water reservoirs in the Region as a whole make it impossible for local supplies to fill more than a relatively small portion of the water requirements, further development of ground water resources in other parts of the Region is necessary.

Development of additional information on the occurrence, movement, and quality of ground water is a prerequisite to optimum utilization of this local supply. Therefore, the Department of Water Resources undertook a systematic survey of ground water conditions in the 11 hydrologic units and 54 hydrologic subunits of the San Diego Region shown on Plate 1.

OBJECTIVES OF INVESTIGATION

The objectives of this investigation were to determine the water quality conditions in the study area and to identify the nature and extent of the water quality problems.

Programs for which this investigation will form the initial phase include projects under the Porter-Dolwig Ground Water Basin Protection Law; advice to the San Diego Regional Water Quality Control Board (No. 9); and long-range planning studies for water.

SCOPE OF INVESTIGATION

The area investigated - the San Diego Drainage Province - is referred to as the San Diego Region in this report. It includes that part of San Diego County which drains to the Pacific Ocean and portions of Orange and Riverside Counties (Plate 1).

For this study, available geologic, hydrologic, and water quality data in the files of the Department and other public and private agencies were reviewed, and pertinent information was extracted and compiled.

Investigations in the field included reconnaissance geologic mapping, well canvassing and ground water level measuring, ground and surface water sampling, analyzing of samples for chemical constituents, and reviewing developed portions of the Region to determine land and water use.

The investigation was conducted from December 1963 through December 1965. Most data presented in this bulletin were collected subsequent to January 1960. Some data collected as early as 1950 were reviewed and pertinent information from these data is included within the Bulletin.

A list of reports, on earlier investigations, which were reviewed during the course of this investigation, is presented in Appendix A.

AREA OF INVESTIGATION

The San Diego Region, shown on Plate 1, is a northwesterly trending, approximately oblong area of about 3,900 square miles. It is located in the southwesternmost part of California, largely in San Diego County and partly in Orange and Riverside Counties. This area, the same as that under the jurisdiction of the San Diego Regional Water Quality Control Board (No. 9), is defined in Section 13040(f), Article 1, Chapter 4, Division 7 of the California Water Code as comprising "all basins draining into the Pacific Ocean between the southern boundary of the Santa Ana Region and the California-Mexico Boundary."

The Region averages about 45 miles in width and extends for approximately 80 miles along the Pacific Coast, from the drainage divide in the San Joaquin Hills near Laguna Beach, south to the United States-Mexico International Boundary.

Topography

The most prominent physical feature of the Region is the northwest-to-southeast trending Peninsular Range that comprises the Santa Ana, Agua Tibia, Palomar, Hot Springs, Aguanga, Volcan, Cuyamaca, and Laguna Mountains. Elevations vary from sea level to 6,811 feet at Thomas Mountain, located in the northeast corner of the Region due north of Anza.

Eight principal stream systems, originating on the western slope of the Peninsular Range, discharge into the Pacific Ocean. From north to south these are San Juan Creek and the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Rivers.

Climate

The climate near the coast is generally mild. Temperatures average about 65 degrees Fahrenheit and precipitation averages 10 to 13 inches. Proceeding inland, as elevations increase, average temperatures decline to 57 degrees Fahrenheit in the Laguna Mountain area and precipitation increases to more than 45 inches in the Palomar Mountain area. Temperature and rainfall intensity variations are larger in the inland portions. The recorded maximum is 11.5 inches of rainfall in 90 minutes at Campo on August 12, 1891. Precipitation occurs principally as rain, with snow common only in the high mountains.

Cultural Development

Historically, development in the San Diego Region has centered around irrigated agriculture, livestock, and mining. However,



Irrigated Agriculture
near Fallbrook, 1963

From the Historical Collection
of Title Insurance and Trust Company
San Diego, California

Avocados have continued as a principal produce.

within the past 25 years, the construction of military installations and manufacturing facilities, such as the aerospace industries, has brought a population influx that has radically changed the pattern of development, particularly in the western portions of the Region. The discussion on cultural development in the following section has been divided into agriculture, urban and suburban, and mining activities.

Agriculture

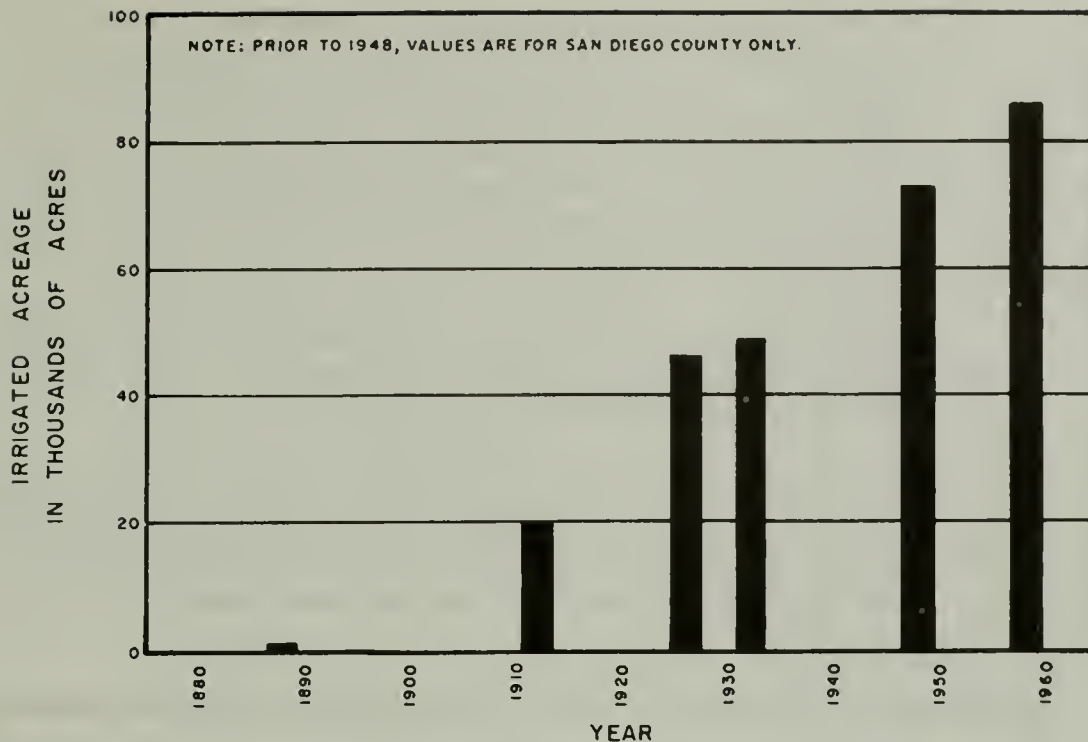
Agriculture and the raising of livestock, which have long been major economic activities in the area, are dependent upon the development of water supplies in the Region. Early settlers diverted flows of surface streams in the mountain valleys for the irrigation of forage crops and for livestock watering. Later, ground water supplies were developed to support increasing acreages of irrigated crops.

The first known agricultural development in the San Diego Region came with the founding of Mission San Diego by the Franciscan Fathers in 1769. Water from the San Diego River, originally obtained by surface diversion and later supplemented by wells dug in the river, was used to irrigate fields surrounding the Mission. Similar agricultural development accompanied the establishment of Mission San Luis Rey and San Juan Capistrano.

Not until the latter half of the 19th century did significant expansion of irrigation begin. This development was brought about mainly by completion of the first railroad in 1885 from Los Angeles to San Diego and the resulting real estate boom. However, until the completion of the Sweetwater and Cuyamaca water systems, irrigation was confined to the small and scattered areas in the various stream valleys. The irrigated acreage increased steadily as additional surface water storage and diversion facilities were constructed and as ground water supplies were utilized.

Winter truck crops were first grown commercially near San Diego about 1910, and avocados and other subtropical fruits in 1915. The mild climate with long frost-free periods was found highly favorable for production of these crops and was, therefore, influential in stimulating an intensive agricultural development in areas where water was available.

The growth of irrigated agriculture, based on surveys made in 1888, 1912, 1926, 1932, 1948, and 1958, is shown on Figure 1. The amount of irrigated agriculture increased more than tenfold between 1888 and 1912, and more than doubled between 1912 and 1926. These were the periods in which



IRRIGATED AGRICULTURE IN SAN DIEGO REGION

FIGURE I

increasing amounts of water were developed for irrigation. Increases in irrigated agriculture acreage between 1926 and 1932 were minor. After that, lands were again brought into production at an increasing rate.

The pattern of agricultural land use has remained fairly stable during the past half century, with avocados, citrus, and truck crops continuing as the principal produce. Despite the encroachment of urban and suburban development on zoned agriculture lands, irrigated agriculture has continued to increase at a fairly stable rate.

Urban and Suburban

The population of the San Diego Region, which grew slowly until the latter part of the 19th century, was limited in large part by a lack of firm water supplies and adequate transportation facilities. After the turn of the century, with the initiation of several water development projects and the completion of the first railroad, the population of the area began a generally steady but accelerated growth -- the rate of which exceeded that of either the State or the nation during the first half of the 20th century. As shown

on Figure 2, the population of San Diego Region increased to 1,062,100 in 1960. In 1965, the population exceeded 1,200,000. Of this total, about 90 percent resided within the area serviced by the San Diego County Water Authority, that is, roughly, the western half of the Region. The City of San Diego, the largest population center, as of January 1965 had a population of nearly 645,000. By 1990, the population in the San Diego Region is expected to be more than 2,000,000.

Although the total water service area is now almost equally divided between agricultural and urban-suburban lands, the Region -- especially in the coastal portions -- is rapidly becoming predominantly urban-suburban.

Between 1948 and 1958, the increase in urban-suburban lands was 74 percent, or about three times as great as the percentage increase experienced in irrigated agriculture. This tremendous growth is most apparent in the densely populated San Diego metropolitan area and the less populous but also

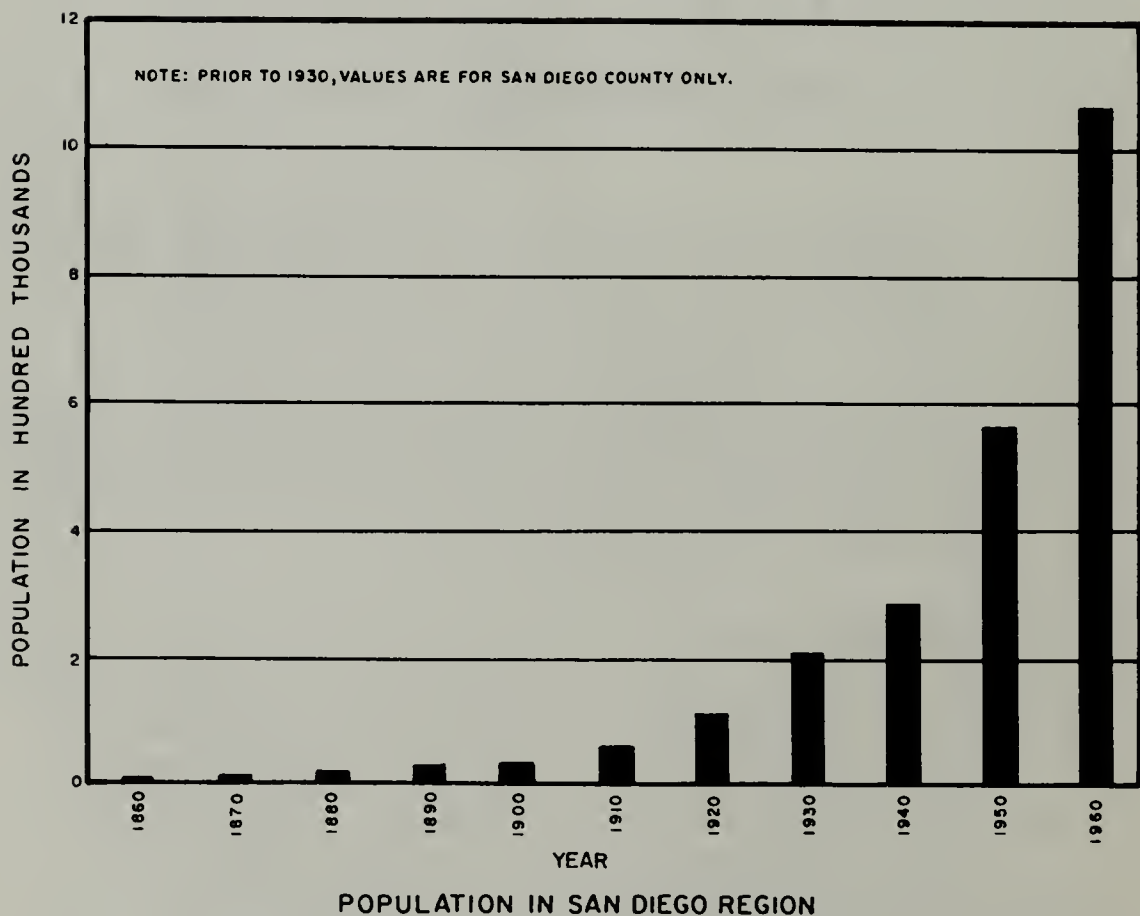


FIGURE 2

rapidly growing communities, such as Escondido, Oceanside, Carlsbad, Fallbrook, Laguna Beach, San Juan Capistrano, Ramona, San Clemente and others.

Major economic endeavors in the area are the aerospace and aircraft industries and ocean fishing. In addition, the headquarters of the U. S. 11th Naval District, with its vast facilities, is in the San Diego metropolitan area. Camp Pendleton, the largest U. S. Marine Corps base in the nation, is near Oceanside.

A center of tourist attractions and a mecca for retired persons, the Region serves as a gateway to Mexico through Tijuana, Baja California.

Mining

Mineral deposits are widespread, and mining activity has been economically important since gold was discovered near Julian in 1869. Prior to this, Indians and early-day Spanish and Mexican inhabitants are said to have recovered small amounts of gold from deposits southeast of what is now Escondido. In the late 1700's and early 1800's, some noncommercial mining was done by the early Spanish settlers. They used stone and adobe for construction of buildings, walls, and small dams. Important commodities produced in former years include gold (mainly 1870-75 and 1887-1900); gem minerals, especially tourmaline and kunzite (mainly 1900-12); feldspar (1918-43); and lithium mica (1892-1928). Important commodities produced in recent years are dimension stone, salt, magnesium chloride, clay, pyrophyllite, and specialty sands. At present, the principal commodities mined are sand and gravel along with crushed and broken stone (Weber, 1963).

PRESENTATION IN REPORT

For this study, the San Diego Region (drainage province) was divided into 11 hydrologic units and 54 hydrologic subunits with boundaries shown on Plate 1. The boundaries are identical with those in DWR report, "Names and Areal Code Numbers of Hydrologic Areas in the Southern District", which was published in April 1964.

More than 100 ground water basins have been delineated in the Region; many of these have been described in previous reports. Hydrologic units investigated during this study are designated by the code and name shown on Plate 1. They are discussed in Chapter VI according to their numerical sequence within the San Diego Region.



1917

San Diego

1963



From the Historical Collection
of Title Insurance and Trust Company
San Diego, California

A rate of growth which exceeded that of either the State or the nation.

The report first presents an overall picture of the geologic, water supply, and water quality conditions in the San Diego Region and then concludes with a detailed account of conditions within the individual hydrologic units and subunits.

Emphasis is placed on the use of illustrative material to present the interpretative data in this report.

FINDINGS

The findings of this investigation may be summarized as follows:

1. The three influences on the chemical quality of water resources in an area -- geologic environment, hydrologic environment, and activities of man -- are closely inter-related in their effects upon the water resources of the San Diego Region (an area which extends approximately 45 miles inland from the coast and southerly from the drainage divide near Laguna Beach to the California-Mexican Boundary).

For example, the general deficiency of precipitation and consequent reduced runoff over the past 20 years and the limited size of the ground water reservoirs, coupled with an accelerated population growth, have resulted, to a large degree, in depleting the water resources of much of the Region. Consequently, overdraft conditions developing in some of the major alluvium-filled coastal valleys have resulted in seawater intrusion and connate water invasion which have impaired the chemical quality of the native ground water. This depletion and impairment have been directly reflected in the increased requirements for importation of Colorado River water. Although, for the Region as a whole, this imported water constitutes approximately 80 percent of the supply, some areas are entirely dependent upon local ground and surface water sources.

2. The principal factors within the geologic environment that have influenced the constituents dissolved in surface and ground water are the chemical composition of the rocks and the weathering processes which these rocks undergo and, to a lesser degree, the natural discharge of hot springs.

3. The chemical quality of water in the San Diego Region has been modified to varying degrees as a result of man's activities. These include importation of Colorado River water, use of reclaimed waste water and desalinized water, intrusion of sea water, invasion by connates, development of adverse salt balance conditions, disposal of domestic and industrial

wastes, and application of chemical fertilizers. Future importation of Northern California water will also influence and ameliorate the chemical quality of these waters.

4. The principal water quality problems in the Region are the impairment of chemical quality of ground water in the alluvium-filled valleys in some of the coastal areas as a result of sea-water intrusion, connate water invasion, or both and the impairment of the water quality in some inland communities from waste water disposal practices and irrigation return.

5. The major rock types in the study area are alluvium, residuum, Pleistocene sediments -- principally the Pala Conglomerate, Temecula Arkose, and Pauba Formation of continental origin; pre-Quaternary sediments -- largely the San Diego, Capistrano, San Mateo, and La Jolla Formations of marine origin and the Poway Conglomerate, largely of continental origin; and crystalline rocks -- principally tonalites, granodiorites, gabbros, and metamorphics. Of these, the crystalline rocks, which form the Southern California Batholith, are the largest single group. Residuum has developed in situ on these crystalline rocks. The alluvium and pre-Quaternary sediments are mainly located in the coastal plain section of the study area with the continental Pleistocene sediments occurring largely in the mountain-valley section of the Region.

6. Most of the readily extractable ground water is obtained from reservoirs consisting of alluvium and Pleistocene sediments, with lesser amounts from pre-Quaternary sediments, residuum, and fractured and jointed crystalline rocks.

7. The chemical quality of ground water from alluvium is highly variable, but generally where it is over-extracted in the coastal areas, it has a total dissolved solids (TDS) content exceeding 1,000 ppm and a sodium chloride character. Proceeding inland, the TDS usually decreases to less than 500 ppm, with a sodium to calcium bicarbonate character. Ground water extracted from the alluvium generally varies from marginal to inferior for domestic and irrigation uses in the coastal areas and suitable to marginal in the inland areas.

8. In general, ground water from the continental Pleistocene sediments has a TDS concentration falling within 200 to 600 ppm, a calcium to sodium bicarbonate chemical character, and is of suitable chemical quality for domestic and irrigation uses.

9. The pre-Quaternary sediments, which are largely marine in origin and in part water bearing, contain partially flushed

connate waters of varying chemical quality. These waters generally have a TDS concentration of 400 to 2,000 ppm, a sodium to calcium and bicarbonate to chloride chemical character, and are marginal to inferior for domestic and irrigation uses.

10. Ground water extracted from the fractured and jointed crystalline rocks generally has a TDS concentration that falls between 150 and 700 ppm, a calcium to sodium bicarbonate character, and a chemical quality suitable for domestic and irrigation uses. However, ground water extracted from residuum is generally much more variable in chemical quality.

11. In the San Diego Region, the four major cations normally found in natural water, in general order of decreasing abundance are: calcium, sodium, magnesium, and potassium. They are derived from the principal chemical constituents of the crystalline rocks -- oxides of silicon, aluminum, iron (relatively insoluble), calcium, magnesium, sodium, and potassium.

12. Although potassium is present in most of the crystalline rocks, its concentration in surface and ground water is negligible. This results from the adsorption of potassium by clayey materials and from other complex physicochemical processes.

13. If the chemical analysis of a specific crystalline rock type is known and if the conversion technique presented in this study is used, it is possible to estimate the cation chemical character of the water that comes into contact with that rock type.

CONCLUSIONS

Based on the findings of this study, the following conclusions may be drawn:

1. Because of the depletion of local water supplies and the impairment of their chemical quality, many parts of the San Diego Region are in need of supplemental supplies, such as imported Northern California water, desalinized water, and reclaimed waste water. These supplemental waters could be used to recharge ground water reservoirs. Ground water replenishment would improve the chemical quality of the local ground waters by flushing out encroaching connate and sea waters.

2. The interrelationships evaluated in this study between the geologic and hydrologic environments and the activities

of man on the one hand and chemical quality of the water on the other hand proved a valuable tool in this investigation, and should be applicable in other areas. Utilizing this method, the evolution of the water quality in the study area was ascertained. This technique also can be used to predict future trends in water quality.

CHAPTER II. GEOLOGY

This chapter presents a discussion of the general geology of the San Diego Region. Detailed discussions of those geologic features which significantly affect the hydrology and water quality of the hydrologic units and subunits are presented in Chapter VI.

Investigation of the geology included a study of the various rock types and their distribution and the effects of the chemical properties of these rocks on water quality. These facets are discussed in detail in Chapter V.

The major water-bearing rock types are the unconsolidated to semiconsolidated sediments and, to a lesser degree, the consolidated sediments, residuum, and fractured crystalline rocks.

Field mapping of the major water-producing areas in the San Diego Region was done by Department of Water Resources personnel. This information was integrated with geologic maps of consolidated sediments and crystalline rocks compiled and/or mapped by the California Division of Mines and Geology (1962 and 1966), and modified where necessary.

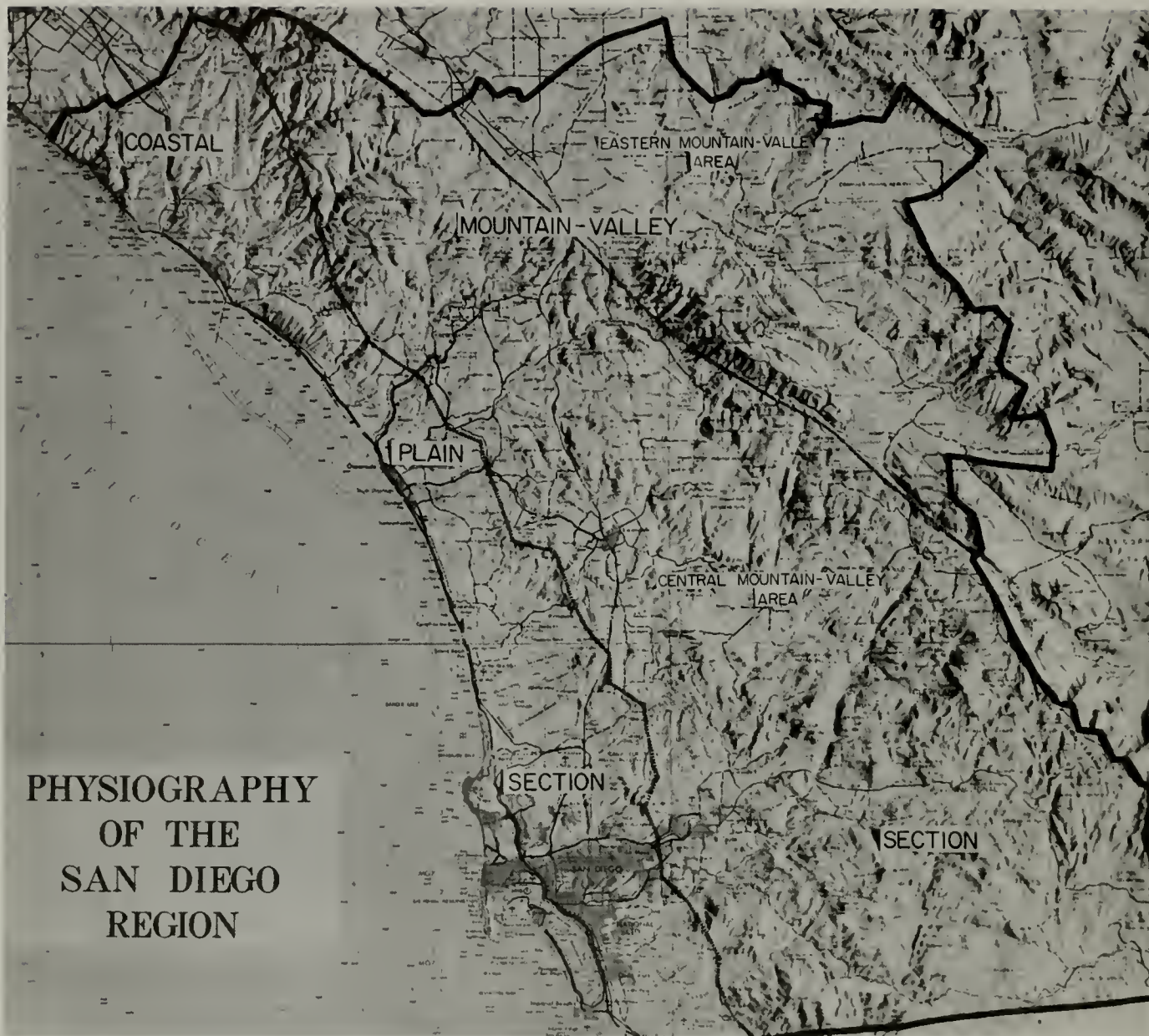
Reports by Ellis and Lee (1919), and Larsen, Everhar, and Merriam (1951), and Weber (1963) cover major portions of the Region.

The aspects of geology which are discussed in this chapter are geologic history, physiography, soil characteristics, geologic rock types, and structural geology. Selected references are presented in Appendix A and a list of definitions is presented in Appendix B.

GEOLOGIC HISTORY

Data utilized to interpret the sequence of events which occurred in the San Diego Region were largely obtained from Bulletin 170 of California Division of Mines (1954). The significant events that form the history are described here in chronological order from oldest to youngest.

1. Originally, the Region was part of a vast area composed of pre-batholithic rocks. These rocks were subsequently subjected to tectonic forces which resulted in their folding, faulting, and metamorphism.
2. A magmatic body (the Southern California Batholith), probably related in part to the above-mentioned metamorphic



**PHYSIOGRAPHY
OF THE
SAN DIEGO
REGION**

U. S. Army Map Service
Corps of Engineers

The Region may be divided from west to east into
two major sections--a coastal plain section and
a dissected mountain-valley section.

activity, was emplaced during the beginning of late Cretaceous time. From this body, many separate injections occurred along zones of structural weakness. Many of the existing rocks were intruded and assimilated by encroaching magmatic material and now occur as roof pendants or inclusions of hybrid gneisses and schists within the batholith. Contact metamorphism occurred between the molten material and country rock, allowing recrystallization and formation of new materials. As a result of magmatic differentiation, the composition of the molten mass changed during the cooling process, resulting in the formation of gabbros, then tonalites, and finally granodiorites.

3. After emplacement of the batholith, uplift occurred, allowing most of the overlying rocks to be removed by erosion. The erosion continued until the area was one of low relief and it was deeply weathered.

4. The materials that had been eroded were deposited along the sea margins. Sedimentation also occurred during late Cretaceous time, but subsequent erosion has removed much of this evidence.

5. The Tertiary Period began with deposition of more sediments on a land surface of low relief. During Paleocene time, the northern portion of the Region was subjected to fluctuating seas. In Eocene time, sea level was stabilized and, consequently, marine sediments were deposited.

6. In late Eocene time, regional uplift resulted in erosion and, as relief of this land surface was reduced, a thick deposition of continental sediments occurred.

7. Oligocene and Miocene times seem to have been ones of uplift and tilting in the major part of the Region, except in the northern coastal portion.

8. As the Los Angeles Basin was submerged in middle Miocene time, thick marine beds were deposited, which overlapped the northwestern coastal portion of the San Diego Region. During Miocene time, a breccia, containing rock fragments similar to those now found on Santa Catalina Island, was deposited along the northern coastal portion of the San Diego Region. Because of the similarity between the breccia and rocks on Santa Catalina Island, the breccia was probably derived from a major land mass to the west which now is no longer in existence.

9. Sedimentation in Pliocene time appears to have been discontinuous along the coast and to have taken place in shallow marine embayments, as in the southwestern coastal part, where clastic sediments were deposited.

10. During Pleistocene time, the sea receded from the continent in the glacial periods and returned in the interstages, with clastic marine beds being deposited along much of the coast. These fluctuations in sea level had a marked effect on coastal topography, and many terraces were formed by a combination of wave erosion and deposition.
11. Mid-Pleistocene time was a period of intensive regional diastrophism in which major movements occurred along faults. These movements resulted in the breakup of highland erosion surfaces into major blocks lying at different elevations. A subsequent rise in sea level at the end of the Pleistocene led to the backfilling of coastal river channels with thick deposits of alluvium.
12. During Recent geologic time, crystalline materials have been weathering to form residuum, highland areas have been eroding, and, locally, deposition of river, lake, and beach sediments has been continuing.

PHYSIOGRAPHY

The area of investigation lies within the Peninsular Range Province, one of 11 geomorphic or physiographic provinces of the State of California. This geomorphic province is developed on an extensive uplifted fault block that occupies the southwestern portion of California and extends southward into Baja California, Mexico. The portion of the geomorphic province in the San Diego Region is approximately 80 miles in length and averages 45 miles in width. An additional part of the province, whose surface expression is prominently represented by Santa Catalina, Santa Barbara, San Nicolas, and San Clemente Islands, lies submerged beneath the Pacific Ocean.

The San Diego Region as a whole presents an asymmetric transverse profile having a long, gentle western slope and a steeper eastern slope. Highlands are present toward the east and the topography becomes less rugged toward the west and southwest. On the east, the Region is separated in part from the Colorado Desert by spectacular scarps ranging from 3,000 to 6,000 feet in height. Most of the scarps, which are displayed en echelon, mark the nearly parallel traces of major zones of faulting. Flanking the western slopes of the mountains is an irregular belt of sedimentary rocks cut by wave erosion and subsequently veneered with marine and nonmarine deposits to form a series of terraces and mesas along the coast.

The San Diego Region may be divided from west to east into two major sections: (1) a coastal plain section characterized by prominent marine wave-cut terraces, locally interrupted by



Looking Toward North Bank
of Bed of San Diego River,
November 1960

Giant Photo Service

The coastal plain section is characterized by a series
of dissected wave-cut terraces, which have been modified
by erosion.

stream channels conveying water from the eastern highlands to the Pacific Ocean; and (2) a dissected mountain-valley section which can be further subdivided into a central mountain-valley area and an eastern mountain-valley area.

Coastal Plain Section

The coastal plain section, which is underlain by Tertiary marine sediments with a relatively thin cover of Quaternary deposits, is characterized by a series of dissected wave-cut terraces which extend inland from the coast for about 10 miles.

In the vicinity of Oceanside and San Diego is a series of terraces that have been formed on gently dipping sediments of Cretaceous, Eocene, Pliocene, and Pleistocene age. These terraces range from near sea level to about 1,200 feet in elevation. Many of the surface features of these terraces have been modified or destroyed by extensive erosion.

The coastal plain section has been dissected by various rivers which have formed a series of wide, flat-bottomed alluvium-filled valleys that provide important ground water reservoirs. Among the larger are the San Juan, Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Valleys.

The apparent closure, or necking, of the mouth of several of these valleys may be caused by: (1) differential erosion, for example, near the mouth of the San Luis Rey River a more resistant formation (the San Onofre Breccia) occurs downstream from less resistant sediments (the La Jolla Formation); (2) deposition of stream-carried materials, which have been accentuated by the formation of baymouth bars and, in part, by development of various other features (for example, Batiquitos Lagoon); and (3) a combination of both, as at the mouth of the San Dieguito River.

Mountain-Valley Section

The mountain-valley section, which is characterized by mountains and intermontane basins, makes up approximately two-thirds of the San Diego Region and is subdivided on the basis of topographical differences into a central mountain-valley area and an eastern mountain-valley area.

The central mountain-valley area is bounded by the coastal plain section on the west and by the Elsinore fault zone and the drainage divide of the San Diego Region on the east. The



Escondido and Vicinity, 1962

California Division of Highways

A broad intermontane valley at an elevation of
about 700 feet.

smaller area of the two, the eastern mountain-valley area, is bounded by the Elsinore fault zone on the west and, in part, by the San Jacinto fault zone and the drainage divide of the San Diego Region on the east.

Central Mountain-Valley Area

Elevations of the higher peaks of this area range from 5,687 feet at Santiago Peak, the northernmost extension of the Region, to 6,515 feet at Cuyamaca Peak, and 6,375 feet at Mount Laguna in the southeastern portion of the Region.

The floors of alluvium-filled valleys range from about 500 to 5,000 feet in elevation in a general steplike arrangement of alternating narrow and broad valleys. These valleys, which are prominent in the southeastern portion of the Region, are

probably due to multiple erosion cycles. In addition, several larger broad intermontane basins owe their configuration to structural control and erosion of the crystalline rocks.

The intermontane basins are generally underlain by at least 100 feet of residuum which may be covered in part by a relatively thin cover of alluvial sediments. Examples of these valleys are: (1) Ramona at an elevation of about 1,500 feet; (2) Escondido at about 700 feet; and (3) El Cajon at about 500 feet.

Another characteristic of these intermontane basins is that they have been bypassed by the present major westerly-flowing



Felsenmeer on Mount Woodson,
November 1954

Mel Forbes, Palomar Pictures

A sea of rocks developed on Mount Woodson Granodiorite
near Ramona.

stream systems. The erosion cycles which have developed the Recent alluvial valleys have modified the older intermontane basins. As a result of diastrophism during the late Cenozoic Era, stream piracy took place and several of the older southward-draining stream systems were captured by younger westward flowing streams. Examples of this stream piracy are the San Diego River near El Capitan and the Sweetwater River near Descanso.

Major plateau-like erosional surfaces are well developed in the central mountain-valley area. These surfaces are usually underlain by thick residuum and may show development of a sea of rocks or felsenmeer (boulder field). Regional peneplanation, tilting, and faulting have accounted for the apparent stairstep arrangement of the eroded surfaces. Successively lower surfaces, such as those in the vicinity of Ramona, Valley Center, Fallbrook, and Escondido, have been deeply weathered.

In the southeastern portion of the Region, the highest plateau, which occurs in the vicinity of Laguna Mountain, ranges from about 5,000 to 6,000 feet in elevation. A lower plateau, ranging in elevation from about 3,500 to 5,000 feet, surrounds the higher plateau and extends east from the Campo area northwesterly to the Lake Henshaw area. However, between the Santa Ysabel and Lake Henshaw areas, the lower plateau is interrupted by lowlands.

Westerly and somewhat parallel to this lower plateau is a dissected surface of about 2,500 to 3,500 feet in elevation.

A similar dissected plateau occurs to the north in the Santa Margarita and Santa Ana Mountains, and to the south lies a graben-like structure between De Luz and Escondido.

Eastern Mountain-Valley Area

Beyond the eastern limits of the central mountain-valley area, physiography changes quite markedly.

This area is distinguished from that previously described by marked structural control resulting from parallel and block faulting. In addition, its valleys are broader and flatter. Furthermore, thick continental deposits are developed in grabens, as in the vicinity of Temecula and Murrieta, where the graben floor is covered with Temecula Arkose and lesser amounts of other continental sediments. The tonalites of the eastern mountain-valley area have weathered and eroded to form felsenmeers similar to those in the central mountain-valley area.

The southern portion of the eastern mountain-valley area is generally higher than the northern portion, with mountains ranging from about 5,600 feet to 6,800 feet in elevation. These mountains rise from a plateau of approximately 3,000 feet elevation. A portion of the area, located northwest of a line drawn through Red Mountain and Oak Mountain, is generally lower in elevation than is the southeast portion. It is probably a graben area. This rolling plateau generally ranges from about 1,500 to 2,500 feet in elevation, with Bachelor Mountain reaching an elevation of 2,555 feet; Oak Mountain, 2,643 feet; and Black Mountain, 3,033 feet. West of this plateau, the Elsinore, Murrieta, and Temecula areas lie in a northwest trending graben at about 1,300 feet in elevation.

SOIL CHARACTERISTICS

In this report, the soils of the San Diego Region are assigned to three major groups, depending upon the materials from which they were formed and the processes by which they were derived. These groups are recent alluvial, residual, and coastal plain and old valley fill soils (Holmes and Pendleton, 1918). Because of the prevailing mountainous character of the Region, the soils of the residual group are the most extensive of the three. In addition, another group of miscellaneous materials, classified as rough stony land, forms the largest surface area.

The recent alluvial soils, which consist of materials laid down by comparatively recent stream activities, occur on alluvial fans, in enclosed mountain flats, or as bottom land, in the floors of valleys. They have not undergone the aging processes that have modified the coastal plain and old valley fill soils. The major soil series are the Foster, Hanford, Yolo, and Dublin, with the first two being common in the inland valleys and the second two common to the coastal valleys.

The residual soils have been derived in place through the weathering of the underlying rock material. They occur almost entirely in the mountain-valley section of the Region. These soils consist mainly of the Sierra and Holland soil series.

The coastal plain and old valley fill soils have been derived through the weathering and modification of old unconsolidated waterlaid (generally marine) deposits. They are associated with the coastal plain or with the high terraces and older, often elevated valley floors which sometimes border the streams or valleys. They are made up largely of the Montezuma, Redding, and Kimball soil series.

In general, the soil designations agree with the geologic rock types as presented in this report. The recent alluvial soils are characteristic of areas mapped as alluvium, but also include some Pleistocene sediments. Residual soils are characteristic of areas mapped as residuum and are generally developed on the crystalline rocks. Coastal plain and old valley fill soils are characteristic of areas largely mapped as pre-Quaternary sediments. They also include some Pleistocene sediments. The area classified as rough stony land is characteristic of the mountainous areas where metamorphic rocks and intrusives of the Southern California Batholith are exposed.

GEOLOGIC ROCK TYPES

The various lithologic materials were grouped for this study into five major rock types on the basis of lithologic similarity, water-bearing properties (discussed in Chapter III), geologic age, and area of occurrence (Plates 2A, 2B, 2C, 3A, 3B, and 3C). Table 1 summarizes these rock types and relates them to names used in previous reports. The descriptions of the rock types in the text and in Table 1, in general, are presented from youngest to oldest in age.

Alluvium

Alluvium (Qal) of Recent age generally consists of unconsolidated deposits of gravel, sand, silt, and clay eroded from the surrounding highlands. Alluvial deposits attain their greatest thickness (about 200 feet) in the coastal and larger inland valleys. In the youthful V-shaped valleys and in the broad flat intermontane areas, the alluvium is relatively thin. Lines of equal thickness of valley fill in selected areas are shown on Plates 4A, 4B, and 4C.

For this study, beach and dune sand deposits have been included in alluvium. Along the ocean, low-lying coastal beach and dune sand deposits occur as elongate dune ridges, parallel to the coast. They are less important as reservoirs of ground water than other deposits because they generally occur above the water table. Reddish-brown ironstone concretions are scattered over the surface of some of the more prominent ridges.

Residuum

Residuum (Qr), a product of weathering in situ, is found throughout much of the San Diego Region. Most of the crystalline rocks in the Region are highly susceptible to

TABLE 1
LITHOLOGIC CORRELATIONS IN THE SAN DIEGO REGION

Name and symbol in this report	:	Name in previous reports	:	Geologic age	:	Maximum thickness, in feet	:	Description	:	Distribution in hydrologic units
Alluvium	Qa1	Alluvium		Recent		200		River, stream, and lake deposits. Gravel, sand, silt, and clay.		1 to 11
	Qa1	Dune sand		Recent		--		Coastal dune sand and beach deposits		1 to 11
UNCONFORMITY										
Residuum	Qr	Residuum, decomposed granite, and grus		Recent, in part post-Cretaceous		300		Residual soils, lateritic soils, decomposed granitic rocks, and grus. Frequently covered by thin alluvial deposits. Weathered in situ from igneous and metamorphic rocks.		1 to 7, 9 to 11
UNCONFORMITY										
Pleistocene sediments	Qp4	Older alluvium, river terrace, and unnamed continental deposits		Pleistocene		200		Nonmarine gravel, sand, and silt. Partially cemented and weathered.		1 to 7, 9 to 11
	Qp3	Pala Fanglomerate and unnamed fanglomerates		Pleistocene		400		Continental, subangular boulder deposits, derived from igneous and metamorphic rocks.		2, 3, 5
	Qp2	Pauba and Dripping Spring Formations		Pleistocene		500		Continental fanglomerate, sand, silt, and clay deposits. May be cemented by iron oxide.		2
	Qp2	Temecula Arkose		Pleistocene		2,000		Continental arkosic sand with silicified marl, tuff, silt, and calcareous concretions.		2, 3
	Qp1	Linda Vista Formation		Pleistocene		100		Marine (in part nonmarine) sandstone, siltstone, and conglomerate with abundant iron oxide concretions.		6 to 11
	Qp1	Bay Point Formation		Pleistocene		50		Marine sandstone, coquina, siltstone, and conglomerate.		6 to 11
	Qp1	Sweitzer Formation		Pleistocene		50		Largely nonmarine sandstone, siltstone, and conglomerate, cemented with iron oxide.		6 to 11
	Qp1	Unnamed marine deposits		Pleistocene		300		Marine sandstone, siltstone, and conglomerate; locally has nonmarine sedimentary cover.		1 to 11
UNCONFORMITY										
Pre-Quaternary sediments, and volcanic rocks	Tk	Volcanic rocks		Pliocene		100		Olivine basalt flow		1 to 3
	Tk	Niguel Formation		Pliocene		--		Marine (upper part may be nonmarine) siltstone and sandstone, locally conglomerate.		1
	Tk	Repetto Formation		Pliocene		--		Marine sandy siltstone with minor amount of conglomerate.		1
	Tk7	San Diego Formation		Pliocene		1,400		Marine sandstone, siltstone, and conglomerate with tuff beds.		8 to 11
	Tk6	San Mateo Formation		Pliocene		150		Marine sandstone and conglomerate.		1

LITHOLOGIC CORRELATIONS IN THE SAN DIEGO REGION
(continued)

Name and symbol in this report	Name in previous reports	Geologic age	Maximum thickness, in feet	Description	Distribution in hydrologic units
Pre-Quaternary sediments, and volcanic rocks	Tk ₆ Capistrano Formation	Miocene	1,200	Marine shale, siltstone, and sandstone.	1
	Tk ₅ Monterey Formation	Miocene	500	Marine siliceous shale and siltstone, sandstone, local tuff, and conglomerate.	1
	Tk ₅ San Onofre Breccia	Miocene	2,600	Marine schist breccia, with lenses of sandstone, siltstone, and some conglomerate.	1 to 4
	Tk ₅ Topanga Formation	Miocene	--	Marine conglomerate, sandstone, siltstone and tuff.	1
	Tk ₅ Vaqueros Formation	Miocene	2,500	Marine siltstone and sandstone.	1
	Tk ₅ Sespe Formation	Miocene to Eocene	--	Continental clayey sandstone, grit conglomerate, and sandy clay.	1
	Tk ₅ Santiago Formation	Eocene	--	Marine sandstone, conglomerate, and siltstone.	1
	Tk ₄ Ballena Gravels	Eocene	--	Continental conglomerate, possibly equivalent to the Poway conglomerate.	5 to 7, 9
	Tk ₄ Poway Conglomerate	Eocene	1,000	Continental and in part marine conglomerate overlain by sandstone and underlain by sandstone and mudstone.	5 to 8
	Tk ₃ La Jolla Formation: Rose Canyon Shale	Eocene	1,200	Marine mudstone, siltstone, shale, sandstone, and conglomerate with a few thin limestone beds.	1 to 6
	Torrey Sand	Eocene	200	Marine sandstone, coarse and poorly consolidated.	
	Delmar Sand	Eocene	250	Massive marine mudstone, siltstone, shale, and sandstone.	
	Tk ₂ Martinez Formation	Paleocene	300	Arkosic sandstone and conglomerate	1, 2
	Tk ₂ Silverado Formation	Paleocene	--	Marine (partly nonmarine) conglomerate, clay, sandstone, and grit.	1
	Tk ₁ Chico or Rosario Formation	Cretaceous	2,000	Marine sandstone, siltstone, and conglomerate.	1, 4, 6, 8
	Tk ₁ Trabuco Formation	Cretaceous	1,000	Continental conglomerate and sandstone.	1
UNCONFORMITY					
Crystalline rocks. Granodiorites	Kgr Stonewall Granodiorite, undifferentiated granodiorites, and leucogranodiorites	Late Cretaceous	--	Light colored; weathers to light brown residuum	2 to 7, 9, 11
	Kgr ₁ Woodson Mountain Granodiorite	Late Cretaceous	--	Light colored; weathers along joints resulting in broad felsenmeer of rounded core stones.	1 to 7, 9 to 11
Tonalites	Kto Aguanga Tonalite, undifferentiated tonalites, and quartz diorites	Late Cretaceous	--	Light gray color; weathers to residuum and broad felsenmeer.	2, 3

LITHOLOGIC CORRELATIONS IN THE SAN DIEGO REGION
(continued)

Name and symbol in this report	:	Name in previous reports	:	Geologic age	:	Maximum thickness, in feet	:	Description	:	Distribution in hydrologic units
Crystalline rocks Tonalites	Kto ₃	Bonsall Tonalite		Late Cretaceous		--		Light to dark gray, characterized by abundant dark inclusions; weathers deeply to thick reddish-brown residuum; often leaves felsenmeer of light brown core stones.		1 to 5, 7, 9 to 11
	Kto ₂	Lakeview Mountain Tonalite and/or La Posta Quartz Diorite		Late Cretaceous		--		Light colored, relatively unweathered exposures in road cuts; weathers to light colored arkosic residuum forming broad felsenmeer.		2, 3, 5, 7, 11
	Kto ₁	Green Valley Tonalite		Late Cretaceous		--		Dark gray; weathers deeply leaving deep reddish-brown residuum and sometimes felsenmeer.		1, 4 to 7, 9 to 11
Gabbros and diorites	Kbi	San Marcos Gabbro, Cuyamaca Gabbro, Viejas Diorite, and undifferentiated gabbros and diorites		Late Cretaceous		---		Dark gray to black; weathers deeply to form dark reddish-brown residuum with isolated core stones. Gabbro known as "black granite".		1 to 7, 9 to 11
Metamorphic rocks	M ₃	Hybrid and undifferentiated metamorphic rocks		Pre-Late Cretaceous		--		Recrystallized gneissic and mixed rocks of prebatholithic and batholithic origin.		2, 3, 5 to 7, 9, 11
	M ₂	Santiago Peak Volcanics, Black Mountain Volcanics, and Alisitos Formation		Cretaceous and/or Jurassic (?)		15,000		Metamorphosed to partially metamorphosed lava flows and tuff breccia of andesite, dacite, and rhyolite; tuffaceous sandstone, shale, quartzite, and conglomerate.		1 to 11
	M ₂	Bedford Canyon Formation		Triassic and/or Jurassic		20,000		Slightly metamorphosed siliceous siltstone and slate, interbedded with graywacke, sandstone, breccia conglomerate, and quartzite.		1 to 6
	M ₁	Julian Schist		Pre-Cretaceous		12,000		Quartz mica schist and quartzite. Weathers to dark reddish-brown residuum.		7, 9, 11

various degrees of weathering. Where these rocks have been sufficiently weathered, the surface is underlain by residuum, commonly referred to as decomposed granite (D. G.) or grus.

The intrusive rocks, especially tonalites, weather to a well developed residual soil profile that exhibits a zonal development in the San Diego Region. According to Ruxton and Berry (1957), the granites in Hong Kong have developed a weathered profile showing four zones of development.

In the San Diego Region, the intrusive and metamorphic rocks weather to a reddish-brown residuum. In weathering, the ferromagnesian minerals (biotite and hornblende) decompose first, followed by the feldspars (plagioclase and orthoclase). When orthoclase begins to decompose, the rock containing it breaks into granular fragments called grus. Grus, because of its granular nature, is used for borrow material. With

continued weathering, the ferromagnesian minerals and feldspars are almost completely decomposed to clay minerals. The grus then becomes a dark red-brown, sandy argillite or lateritic residuum.

Spheroidal weathering or exfoliation of intrusive rocks produces the most noticeable weathering remnants. Chemical and mechanical action penetrating inward from the surface results in the formation of "core stones" surrounded by matrix of residuum. As this residuum is removed, the core stones collect on the surface as a felsenmeer.

Weathering (decomposition and disintegration) is most advanced at the ground surface where the rocks have been completely reduced to small particles. The degree of weathering decreases downward to solid rock at depths generally less than 100 feet, but in some areas more than 200 feet (Plates 3A, 3B, and 3C).

The parent materials for residuum are the crystalline rocks (tonalites, gabbros, granodiorites, and metamorphic rocks). Residuum is generally most extensively developed in the tonalite and gabbro terranes because they contain a higher percentage of ferromagnesian minerals. Moreover, the tonalites usually contain many inclusions of older rocks which increase their susceptibility to weathering.

On the other hand, the granodiorites are more resistant to weathering. This is indicated by the fact that the felsenmeer or boulder fields are more prominent in the granodiorites than they are in the tonalites and gabbros which, as pointed out previously, may develop a more extensive residuum cover.

Residuum is considered as being of Quaternary age in this report. However, at Alberhill near Lake Elsinore reddish residuum formed on the crystalline and metamorphic rocks is overlain by Paleocene clayey sediments. Therefore, it is assumed that residuum has also formed prior to Paleocene time in the San Diego Region.

The permeability of the residuum is considered to be low to moderate. Although the yield of wells in residuum is comparatively low, locally it is an important water-bearing material.

Nearly all the crystalline rock areas have at least a thin, in part discontinuous veneer of residuum. In many of the highland areas, the residuum lies generally above the water table and is not a significant contributor of ground water. Also, because of increasing cultural and agricultural development, many of the historic water-bearing areas have been dewatered.



Core Stones and Residuum

Although the yield of wells in residuum is comparatively low, locally it is an important water-bearing material.

Outcrops of Water-Bearing

Pala Fanglomerate

These semiconsolidated, continental sediments are important sources of ground water and are tapped by many wells.





Temecula Arkose

Some of the wells extracting ground water from the Temecula Arkose produce in excess of 1,500 gallons per minute.

Rocks

(See also page 32)



San Diego Formation

Although this formation is considered to be only of low-to-moderate permeability, numerous water wells tap it as a source of supply.

Pleistocene Sediments

Pleistocene sediments (Qp_{1-4}) consist of a variety of materials. These include older alluvium in the coastal area, continental semiconsolidated fanglomerates in the Pala area, Temecula Arkose in the Temecula-Murrieta and Warner Springs area, and consolidated marine and, in part, nonmarine deposits (silts, sandstones, and conglomerates) in the coastal area (see Table 1).

The older alluvium (Qp_4), which is locally extensive, attains a maximum thickness of 200 feet. It is a complex of clay, silt, sand, and gravel, which in part is overlain by alluvium of Recent age. Its brown to reddish-brown color indicates the degree of weathering and cementation by iron oxides. Older alluvium is frequently exposed as erosional remnants in stream-cut terraces along the sides of valleys.

The semiconsolidated, continental Pala fanglomerate (Qp_3) outcropping in the Pala-Pauma area has a maximum thickness of 400 feet. The Pauba and Dripping Spring Formations (Qp_2), which occur in the Temecula-Aguanga area, are generally less than 500 feet thick. The Temecula Arkose (Qp_2), generally less than 2,000 feet thick, crops out in the Temecula-Murrieta and Warner Springs areas. These Pleistocene sediments consist of clays, silts, sands, gravels, and minor calcareous deposits.

The Linda Vista Formation (Qp_1), Bay Point Formation (Qp_1), and related unnamed marine and, in part, nonmarine deposits consist of sandstones, siltstones, and conglomerates. These largely consolidated deposits, which occur in the coastal plain, are generally less than 300 feet thick. They have been subject to several periods of marine deposition and marine wave erosion during the Pleistocene Epoch as evidenced by a series of coastal terraces. The terraces extend inland as much as 8 miles in the vicinity of the City of San Diego, narrowing to less than 1 mile in the vicinity of Laguna Beach.

Pre-Quaternary Sediments and Volcanic Rocks

The pre-Quaternary sediments and volcanic rocks (TK_{1-7}) consist of many lithologic formations, varying from the Pliocene San Diego Formation to the Cretaceous Trabuco Formation (Table 1).

This unit, although largely confined to the area 7 to 12 miles from the coast, extends 20 miles inland from La Jolla to the vicinity of San Vicente Reservoir. Tertiary marine sediments, Eocene to Pliocene in age, are the predominant rocks occurring in this unit. They include siltstone, sandstone, conglomerate, shale, mudstone, and breccia.

These sediments attain a maximum thickness of 2,500 feet or more in the Miocene San Onofre Breccia and Vaqueros Formation. Other major formations, with comparable thicknesses, are the San Diego (1,400 feet), Capistrano (1,200 feet), Poway Conglomerate (1,000 feet), La Jolla (1,650 feet), Chico or Rosario (2,000 feet), and Trabuco (1,000 feet).

The Pliocene San Diego Formation (TK₇), exposed largely south of the San Diego River, is principally marine in origin. This formation, which underlies or caps the mesa areas, consists of sandstone, siltstone, and conglomerate, along with some volcanic tuff beds, all of which vary in thickness. Very coarse-grained sands and well-bedded cobbles and boulders are found at the base of some sections. Although this formation is considered to be only of low-to-moderate permeability, water wells penetrate it to depths of more than 1,000 feet.

The marine Miocene (in part, early Pliocene) Capistrano and San Mateo Formations (TK₆), exposed in the northwestern portion of the Region, consist largely of sandstone, siltstone, and shale, along with some gypsiferous deposits. Northwest of Arroyo Trabuco Creek, the sediments grade laterally into a white massive sandstone. Near the mouth of San Mateo Creek, the Capistrano Formation is masked by 40 to 80 feet of Recent alluvium. The finer sediments are relatively impermeable and generally nonwater-bearing, whereas the coarser sediments may locally be water-bearing.

The San Onofre Breccia (TK₅) of Miocene age consists of a well-cemented schist breccia with lenses of sandstone, siltstone, and some conglomerate. This resistant formation is exposed in the northern coastal portion of the San Diego Region as an elongated band averaging 2 miles in width. Although the San Onofre Breccia is considered to be relatively impermeable and not capable of transmitting appreciable amounts of water, small flows are obtained from springs.

Other significant Miocene sediments are the Monterey, Topanga, and Vaqueros Formations (TK₅), all of which occur in the northwestern portion of the study area. These formations, marine in origin, consist largely of sandstone, siltstone, conglomerate, tuff, and shale, possibly intercalated with gypsiferous beds. These sediments are generally impermeable and essentially nonwater-bearing, although locally water might be obtained from the coarser phases. Several dry holes have been drilled to depths of between 600 and more than 1,000 feet in the Monterey Formation.

The Eocene Poway Conglomerate (TK₄), about 1,000 feet in maximum thickness, occurs largely in the central to southern coastal portion of the San Diego Region and overlies the



Poway Conglomerate

Some production is obtained from the Poway Conglomerate, but yields from wells have been highly variable.



La Jolla Formation

The La Jolla Formation has been drilled extensively, although amounts of water produced have been generally small to moderate.

La Jolla Formation. To the east, the Ballena Gravels (TK₄), possibly correlated with the Poway Conglomerate, occur as erosional remnants of old river gravels overlying the crystalline rocks. This conglomerate, mostly of continental origin, is composed of pebbles and boulders largely from volcanic rocks. The conglomerate facies changes in thickness and in places it is overlain and underlain by thick sections of mudstone and sandstone, in part marine in origin.

The Eocene La Jolla Formation (TK₃), consisting of the Delmar Sand, Torrey Sand, and Rose Canyon Shale, occurs extensively in the coastal portion of the San Diego Region. It unconformably overlies the Cretaceous sediments and crystalline rocks. The lowest member, the Delmar Sand, is a multicolored sandstone with beds of sandy shale. The Torrey Sand, overlying the Delmar Sand, consists of a light to reddish-colored, clean, massive crossbedded sandstone. The Rose Canyon Shale (the upper member) is a gray to brown, thick series of mudstone, siltstone, sandstone, and conglomerate strata. Locally, it contains intercalated gypsum beds. The coarser sediments of the La Jolla Formation are moderately permeable and, where situated below the water table, may be water bearing.

The Cretaceous marine Chico or Rosario Formation (TK₁) is exposed in the Point Loma-La Jolla area, and it is exposed even more extensively along the inland coastal portion from San Onofre Creek to the Trabuco Canyon area where the non-marine Trabuco Formation (TK₁) is also to be found. The basal member of these Cretaceous rocks is a reddish-brown conglomerate which is overlain by a series of interbedded sandstone, siltstone, and mudstone strata along with conglomerate beds.

Crystalline Rocks

The crystalline rocks underlie and are exposed throughout most of the San Diego Region. They include granodiorites, tonalites, gabbros and diorites, and metamorphic rocks.

Granodiorites

The granodiorites, of which the Woodson Mountain granodiorite (Kgr₁) is the most widespread, form a major portion of the Southern California Batholith. These crystalline rocks largely occur in a broad, discontinuous, irregular, northwest-trending strip from Tecate on the south to the Wilaomar area on the north. The granodiorites, which are resistant to weathering, form some of the most prominent hills and mountains of the San Diego Region.

The granodiorites are generally lighter colored than the other major bodies of crystalline rocks. In general, they are massive, medium-to coarse-grained, light-gray granitic rocks which consist predominately of quartz, plagioclase, orthoclase, and biotite. Where nearly devoid of dark minerals, the granodioritic rocks are called leucogranodiorites.

These rocks weather and decompose to various depths and degrees; however, the residuum so formed is not as deep or extensive as that characteristic of the tonalites. As a result of weathering along the major joint planes, huge boulders up to 10 to 20 feet in diameter have been formed. In areas of low relief, scattered in situ boulders may rise above the soil to form a felsenmeer. On steeper slopes, the boulders are piled one on the other so as to resemble immense rockpiles.

Tonalites

The Bonsall (Kto₃), Lakeview Mountain (Kto₂), and Green Valley (Kto₁) Tonalites are the most widespread and prominent intrusives in the San Diego Region. They occur in the mountainous areas in wide, interrupted, discontinuous bands, from the southeast portion of the San Diego Region to its northernmost limit. Deeply weathered exposures of the tonalites underlie some of the relatively flat erosional surfaces and intermontane basins, such as the Fallbrook, Valley Center, and Escondido areas.

Tonalites are generally medium-grained, light gray rocks consisting essentially of plagioclase, quartz, hornblende, augite, and biotite. The Bonsall Tonalite differs from the other tonalites in that it contains abundant dark inclusions. The Green Valley Tonalite, much darker than the Bonsall Tonalite (because of a larger amount of mafic minerals), characteristically forms deeply weathered lowlands and hilly topography. On the other hand, the Lakeview Mountain Tonalite, which is lighter in color than the Bonsall Tonalite, forms mountains or plateaus covered with boulders and grus.

The tonalites characteristically weather to greater depths than do the other rock types, and in many areas form a residuum cover at least 100 feet thick. Disintegration occurs with a slight breakdown of the minerals and results in a friable grus matrix (decomposed granite). With more extensive weathering, further decomposition of the rock results in a reddish-brown lateritic, clayey mixture with resistant mineral grains.

Outcrops of tonalite are usually in the form of boulders of disintegration (core stones), which average several feet in

CORE STONES of Green Valley
Tonalite atop hills
above Escondido.



diameter. In road cuts, these boulders appear to be widely scattered within the grus. The felsenmeer formed by the tonalites is generally not as prominent or extensive as that developed from the granodiorites.

Gabbros and Diorites

This group (Kbi), which includes the San Marcos and Cuyamaca Gabbros, Viejas Diorite, and other similar undifferentiated basic intrusive rocks, occurs in places throughout much of the San Diego Region. The gabbros and diorites, generally in areas of 1 to 5 square miles, occur intimately with the older metamorphic rocks. These rocks occur as scattered remnants or roof pendants within the more extensive and younger intrusive bodies of granodiorite and tonalite.

Although the texture and mineral composition of these rocks vary, mountains underlain by them generally have a distinctive, broad-based, somewhat conical form. Their smooth slopes are covered with a deep reddish-brown residuum which supports a dense growth of brush. Outcrops are usually massive and form some of the more rugged mountains, as in the San Marcos and Pala areas, while less resistant exposures occur in areas of low relief.

These rocks, usually dark gray to black and fine- to medium-grained, consist of 60 to 70 percent plagioclase with variable amounts of hornblende, augite, hypersthene, and olivine.

Most gabbroic rocks weather readily, forming a deep reddish-brown lateritic residuum near the surface which becomes more granular with depth. Consequently, the residuum, which frequently extends to depths of 100 feet, may contain large, permeable, water-bearing zones. Locally, joints and fractures may also be water bearing.

Metamorphic Rocks

The metamorphic rocks (M_{1-3}) include hybrid (mixed) and undifferentiated rocks (M_3), the Santiago Peak (M_2) and Black Mountain Volcanics (M_2), the Bedford Canyon Formation (M_2), and the Julian Schist (M_1). These metamorphic rocks occur as two irregular, wide bands which roughly parallel the predominant northwesterly structural trend of the Peninsular Range geomorphic province. Of these two bands, which are largely separated by the intrusive rocks of the Southern California Batholith, the westernmost generally consists of mildly metamorphosed formations which are terminated by an onlap of Tertiary marine sediments. The highly metamorphosed rocks in the other band occur along the roof of the batholith as pendants or inclusions.

The hybrid and undifferentiated rocks, which consist largely of injection gneisses and associated intrusive rocks, are discontinuously exposed in the mountain-valley section of the Region. The most extensive outcrops occur in the area tributary to the headwaters of the San Diego River.

The Bedford Canyon Formation, containing metasedimentary rocks of Triassic and/or Jurassic age, occurs along the western flanks of the Southern California Batholith. These rocks consist largely of mildly metamorphosed argillites, slates, and feldspathic quartzites, which are unconformably overlain by metavolcanics of the Santiago Peak Volcanics and their southerly equivalent, the Black Mountain Volcanics. The metavolcanic rocks consist chiefly of agglomerates, breccia, tuffs, and flows that most commonly range from andesite to quartz latite with lesser amounts of interbedded clastic sedimentary rocks. This irregular belt of metavolcanic rocks generally occurs several miles inland of the coast in the southern area and extends northwesterly to the rugged mountains at Santiago Peak.

The Julian Schist, although not as extensive as the other metamorphic rocks, forms in the eastern part of the Region a prominent, narrow elongate, discontinuous band, which consists largely of a series of quartz-mica schists and quartzites. The Julian Schist occurs as a northwesterly trending irregular strip between the other crystalline rocks.

STRUCTURAL GEOLOGY

A complex system of nearly parallel faults trending northwest is the most prominent structural feature of the San Diego Region. Much of the topographic expression of the Region can be attributed to fault activity. The major faults in the

Region are the Elsinore, Agua Caliente, and San Jacinto fault zones (Plate 2A). The San Jacinto fault zone occurs in the northeasternmost part of the Region. The Elsinore fault zone extends through the Temecula-Murrieta area along the southwestern face of the Agua Tibia and Palomar Mountains. The Agua Caliente fault zone, which passes through Warner Springs, is one of the major parallel faults between the Elsinore and San Jacinto fault zones. Other major northwest trending parallel faults are the Aguanga and Hot Spring faults.

In the coastal region, the Christianitos fault extends south from Orange County into the San Mateo-San Onofre area (Plate 2A). Other faults (Plate 2B) have been mapped in the coastal area but are usually only of local significance. The sediments in the coastal area show little or no folding and dip westward at a low angle.

The topographic expression of the major fault zones is recognized by elongate parallel valleys and/or steep escarpments. However, the trace of some of these faults has been buried, in part, by large masses of slope wash and landslide material as in the Murrieta-Temecula area. In addition to the major faults, there are also numerous minor faults in the crystalline rock areas which are difficult to delineate.

The general drainage pattern of the Region appears to be almost rectangular: that is, both the main stream and its tributaries display right-angle bends. This can be interpreted as an indication of fault control. As a general rule, there are always many more minor fault features than major ones, and there are many more minor drainages than major drainages. Therefore, assuming that fault patterns influence stream courses, the orientations of drainage lines should be indicative of the previously mentioned minor faults. On this basis, measurements of the strike (in direction of flow) of about 180 drainage lines were made, the results of which are shown on Figure 3. This diagram indicates the presence of two drainage line orientations in contrast to the Elsinore fault zone and associated parallel faults: (1) a northeast-southwest trending system that is approximately at right angles to the strike of the Elsinore fault zone; and (2) a nearly east-west trending system at about 45 degrees to the strike of the Elsinore fault zone. The first orientation is thought to reflect part of the original drainage pattern of the Region, which developed on primary fractures associated with the regional stress pattern that formed the Elsinore fault zone. The second orientation represents the consequent drainage pattern that formed on the westward tilted sediments of the coastal plain. These westerly flowing streams have captured the drainage of the original southwest flowing streams to form the present-day drainage pattern as shown by the San Diego and Sweetwater Rivers. On

the other hand, part of the original drainage that formed parallel to the Elsinore fault zone still remains as shown by Temecula and Murrieta Creeks.

Thus, Figure 3 shows an interesting structural pattern in the San Diego Region that is made up of the northwest-southeast trending major faults and associated northeast-southwest trending fractures. This structural pattern in crystalline rocks indicates possible sites for water wells. This is because a major criterion for the occurrence of water in any crystalline rock is the presence of a large number of openings. On this basis, the intersection of northeast trending fractures with the northwest trending major faults would appear to be a likely place to drill for water.

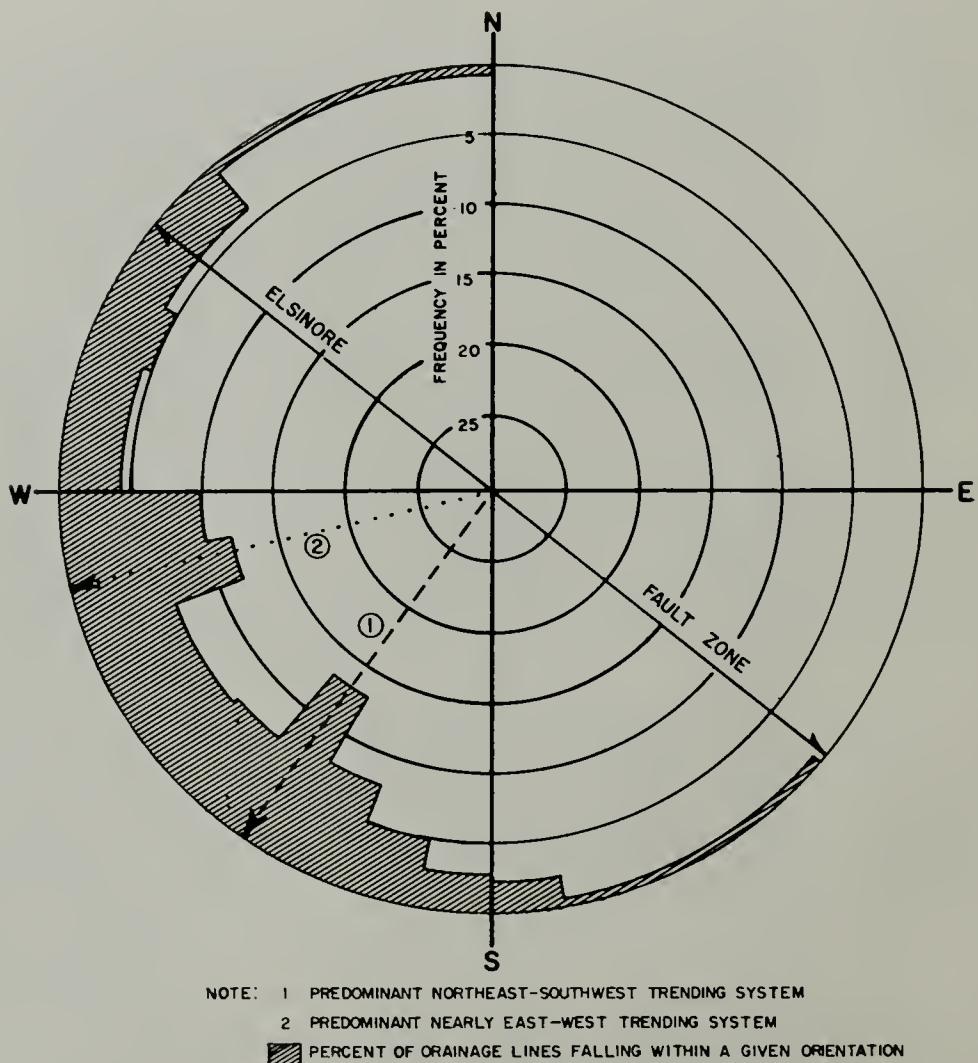


Figure 3.- DIRECTION OF DRAINAGE LINES IN THE SAN DIEGO REGION

CHAPTER III. WATER SUPPLY

Cultural development of the San Diego Region began in 1769 with the founding of Mission San Diego de Alcalá by the Franciscan Fathers near the present City of San Diego. This was nearly coincident with the initial development of the water resources of the area. As early as 1813, the Franciscan Fathers built a reservoir on the San Diego River and conveyed water 6 miles downstream to the mission. Much of the masonry dam and parts of the masonry-lined conduit are still standing.

In 1850, the year California was admitted into the Union, the City of San Diego was incorporated. The first successful organized effort to provide a water supply for the city began with the incorporation of the San Diego Water Company in 1873. A well, 10.5 feet in diameter and 160 feet deep, was dug in 1874 near the mouth of Cabrillo Canyon in what is now Balboa Park. From this well, the first water deliveries were made by the San Diego Water Company. From 1887 to 1924, many reservoirs, such as Cuyamaca, Morena, Otay, and Wohlford, were built.

Since the turn of the century, intense activity in ground and surface water development has taken place in the San Diego Region. In recent years, much of the Region has become a rapidly developing urban-suburban area. This rapid urbanization has led to a steadily increasing demand for dependable supplies of usable water.

The primary uses of water in the San Diego Region are for domestic, industrial, and agricultural purposes. In the area serviced by the San Diego County Water Authority, roughly the western one-half of the San Diego Region, the water production per capita for urban uses during the fiscal year 1963-64, was about 0.14 acre-foot, and for agricultural purposes it was approximately 0.06 acre-foot. In recent years, the ratio of domestic and industrial use to agricultural water use has remained at about two to one, and the increases in water use for agriculture have kept pace with the increasing demands of urban-suburban uses.

PRESENT SOURCES OF SUPPLY

The principal sources of water in the Region are precipitation, runoff, ground water, and imported water. The amounts contributed by each depend upon population density, geography, and climatological conditions. This section deals with the development of these sources and their contributions to the supply. The long-term mean periods referred to in this report were selected from DWR Bulletin Nos. 112 and 130-64.

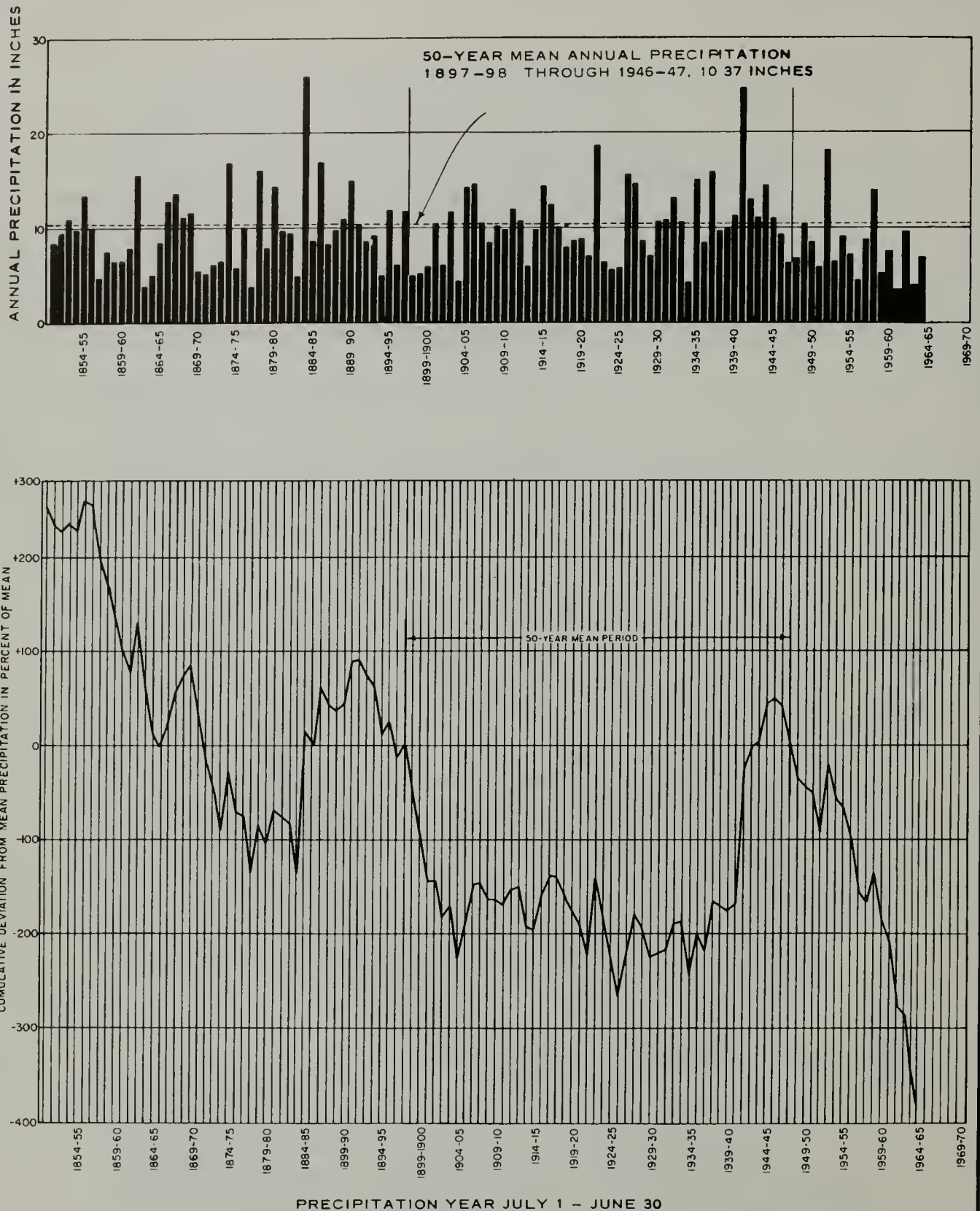


Figure 4 - REPRESENTATIVE PRECIPITATION CHARACTERISTICS FOR SAN DIEGO

Precipitation and Surface Water

Precipitation in the San Diego Region is extremely variable, both geographically and seasonally. The mean annual precipitation (Plate 5) varies from approximately 10 inches near the coast to more than 45 inches in the Palomar Mountain area.

An example of the wide variation in annual precipitation may be seen in Figure 4. At San Diego, the annual precipitation has ranged from about 3 to more than 26 inches for the period of record, 1850-51 through 1963-64. The general deficiency of precipitation at San Diego since the mid-1940's is indicative of the general lack of precipitation throughout much of the Region. This precipitation deficiency has had an important bearing on the amount of runoff and therefore, the Region's local water supply.

Runoff in the San Diego Region results mainly from rainfall. The melting of snowpack also contributes small additional amounts of runoff as do springs.

The major streams draining the coastal section of the San Diego Region include San Juan Creek and the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Rivers. Their valleys are generally characterized by wide, flat, gently sloping floors, bordered by very steep slopes or bluffs several hundred feet high. Their streams have headwaters reaching far back into the highland areas.

There has been a long-term reduction in the amount of runoff produced by these streams as shown by the example in Figure 5 for Santa Ysabel Creek at Sutherland Dam. The deficiency of runoff that began in the mid-1940's coincides approximately with the deficiency of precipitation shown in Figure 4.

However, it should be noted that a moderate increase in precipitation would not cause an immediate increase in runoff. This is because of a lack of moisture in the ground -- a lack that exists both in the alluvium of the valleys and in the relatively thin but widespread residuum in other parts of the drainage areas. Therefore, any moderate increase in precipitation would tend to be absorbed, at first, in the alluvium and residuum before it produced any appreciable runoff and storage in the surface reservoirs.

The mean runoff for the 20-year drought period 1944-45 through 1963-64 at three selected stations (Table 2) further emphasizes the lack of runoff throughout the Region. As can be seen from this table, the mean runoff for the 20-year period was less than 40 percent of the estimated 53-year mean (1894-95 through 1946-47). Consequently, as indicated, there has been a serious

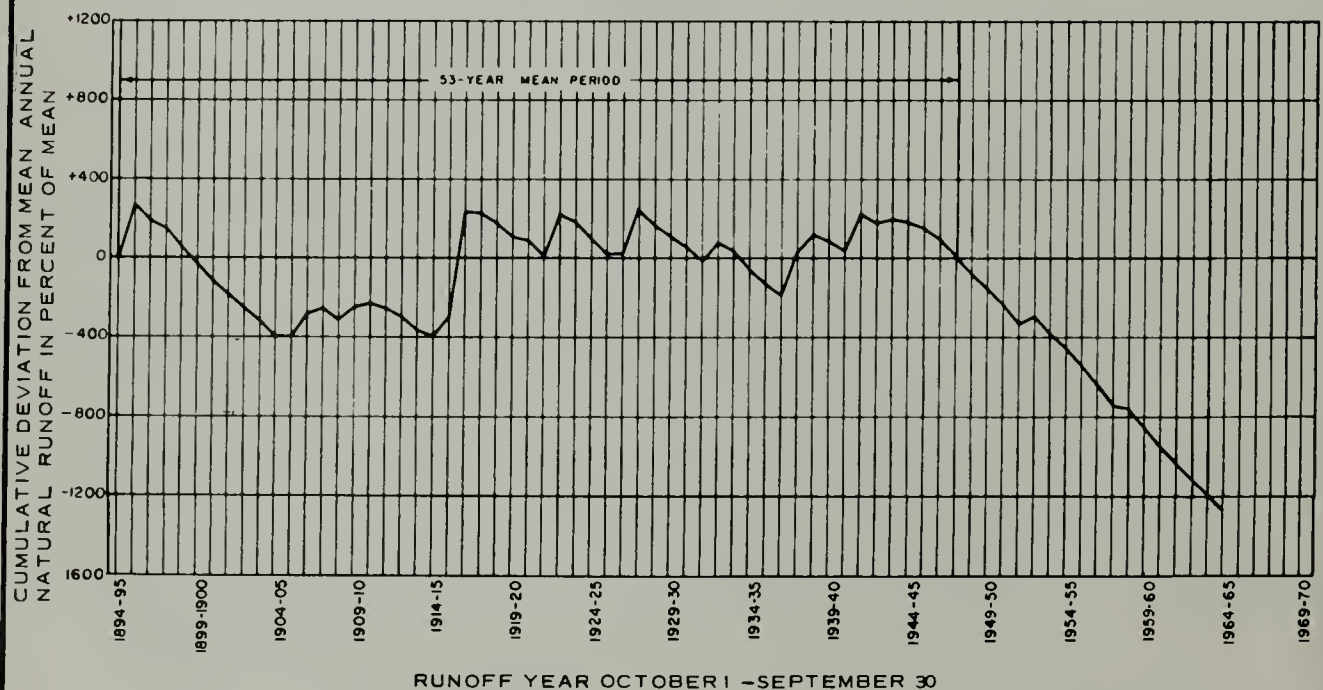
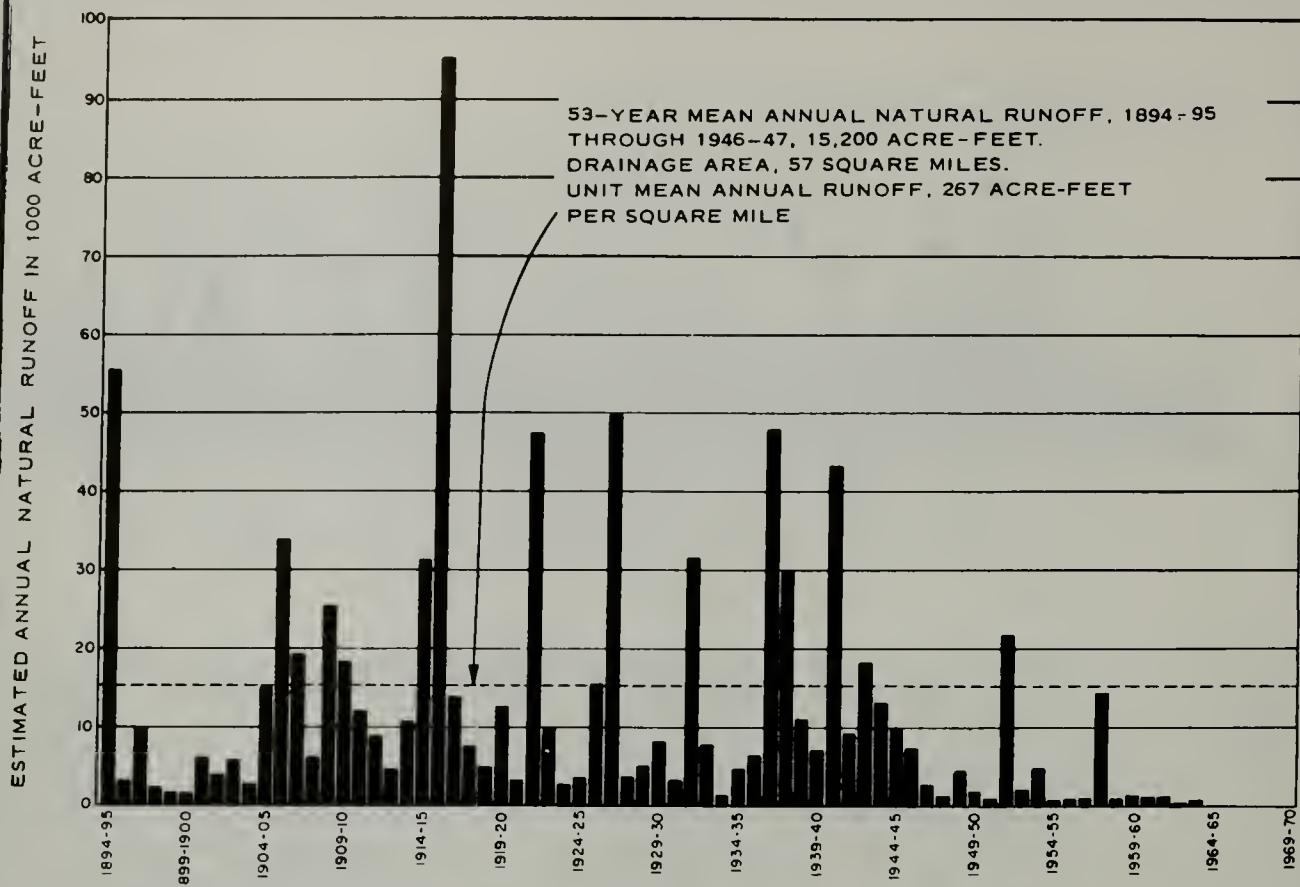


Figure 5 - REPRESENTATIVE RUNOFF CHARACTERISTICS
SANTA YSABEL CREEK AT SUTHERLAND DAM

TABLE 2
ESTIMATED ANNUAL RUNOFF AT
SELECTED STATIONS IN THE SAN DIEGO REGION
FOR 1944-45 THROUGH 1963-64

In acre-feet

Station	Period of record	20-year mean ^a	53-year mean ^b	20-year mean as percent of 53-year mean	Maximum ^c		Minimum ^c	
					Runoff year	Quantity	Runoff year	Quantity
Murrieta Creek at Temecula	1924 to date	3,100	8,670	36	1915-16	60,300	1963-64	280
Santa Ysabel Creek at Sutherland Dam	1913-28 and 1936 to date	3,840	15,200	25	1915-16	95,200	1960-61	130
Cottonwood Creek at Morena Dam	1936 to date	2,150	12,400	17	1915-16	75,300	1947-48	0

a. Estimated mean for 1944-45 through 1963-64.

b. Estimated mean for 1894-95 through 1946-47.

c. Indicated maxima and minima are estimated values for 1894-95 to date.

deficiency of the surface waters which previously had been a major source of supply for the San Diego Region. As of May 1, 1965, 15 major reservoirs held only 17 percent of their total storage capacity, with most of this derived from the storage of imported Colorado River water (Table 3). Locations of these reservoirs are shown on Plates 3A, 3B, and 3C. Thus runoff, which once was a major portion of the San Diego Region's water supply, has now been relegated to a minor role in the overall water supply of the Region.

Ground Water

Historically, ground water has been an important source of supply in the San Diego Region as shown by the large number of wells (Plates 6A, 6B, and 6C) that have been drilled (see Appendix C for well numbering system). The utilization of ground water supplies depends mainly on its availability, which is a function of pumping costs and quality, demand by the populace, and cost and availability of other sources. In recent years, the demand has progressively increased, the availability of ground water has decreased, its quality has been impaired in many areas, and imported Colorado River water has become readily available. These factors have relegated ground water to a minor position as a source of water supply for much of the Region.

However, in many areas in the San Diego Region, such as the Temecula-Murrieta area and Pala-Pauma Valleys, ground water is currently the only supply of water for domestic and irrigation purposes. Elsewhere, small domestic wells are the only source of supply for the isolated or small rancher. In other areas, such as Escondido, ground water is used to supplement supplies from other sources.

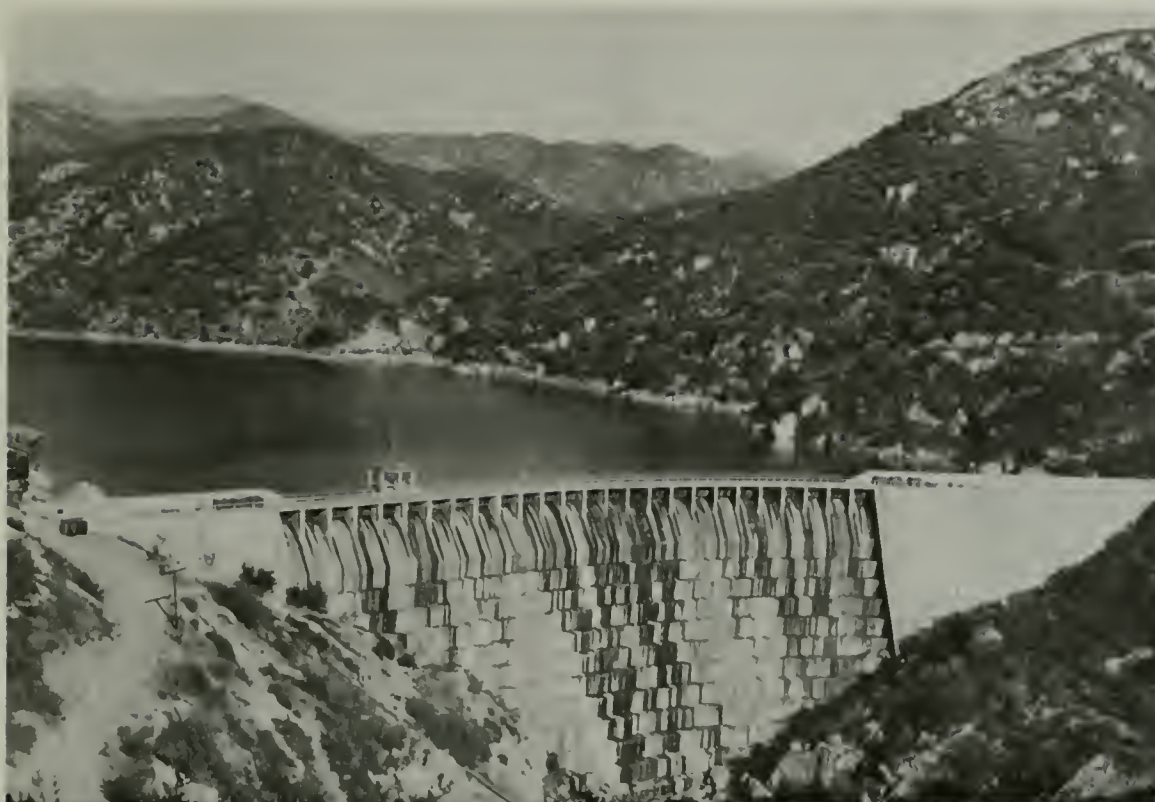
Occurrence

Ground water is found throughout the San Diego Region in variable quantity and quality. Most of the readily extractable ground water is obtained primarily from reservoirs consisting of alluvium and Pleistocene sediments. Smaller quantities of ground water are also found in the pre-Quaternary sediments, residuum, and crystalline rocks. The amounts of ground water available in various portions of the Region depend upon geologic and hydrologic conditions that will be discussed in the following sections.

TABLE 3
WATER IN STORAGE IN MAJOR RESERVOIRS
IN SAN DIEGO REGION

In acre-feet				
Area and watershed	Reservoir	Usable storage capacity	Water in storage	
			As of May 1, 1965	Percent of capacity
<u>Santa Margarita-San Luis Rey Rivers</u>				
Temecula Creek	Vail	49,500	2,360	4.8
San Luis Rey River	Lake Henshaw	194,300	8,820	4.5
<u>San Dieguito-San Diego Rivers</u>				
San Dieguito River	Lake Hodges*	33,600	1,670	5.0
Santa Ysabel Creek	Sutherland	29,700	3,640	12.3
San Vicente Creek	San Vicente*	90,200	72,300	80.2
San Diego River	El Capitan*	112,800	14,210	12.6
Boulder Creek	Cuyamaca	11,600	1,140	9.8
Quail Canyon Creek	Chet Harritt*	10,500	4,750	45.2
Big Surr Creek	Miramar*	7,270	6,250	86.0
Chapparel Canyon	Murray*	5,740	4,480	78.1
<u>Sweetwater-Otay Rivers and Cottonwood Creek</u>				
Sweetwater River	Lake Loveland	25,400	2,130	8.4
	Sweetwater (Main)*	27,700	2,480	9.0
Otay River	Lower Otay*	56,500	2,760	4.9
Cottonwood Creek	Morena	50,200	360	0.7
	Barrett	44,800	1,580	3.5

* Stores imported Colorado River water and some local water.



Barrett Dam and Reservoir
November 15, 1937

City of San Diego

Surface waters were a major source
of supply for the San Diego Region.

Alluvium and Pleistocene Sediments. Unconsolidated alluvial deposits, which fill the river valleys, constitute by far, the most abundant source of ground water. However, in comparison with other major rock types in the Region, they are of limited extent.

The alluvium is generally moderately to highly permeable. It is recharged principally by deep penetration of direct rainfall, percolation of streamflow originating in the watershed, return flow from applied water, and underflow from adjacent areas. A general lack of precipitation and overpumping of the ground water reservoirs, as in the San Dieguito, Tia Juana, and San Luis Rey River Valleys (Plate 7), have caused a reversal of the historic seaward hydraulic gradient resulting in sea-water intrusion and migration of connate waters. Therefore, the usefulness of the alluvium as a source of ground water in many coastal areas has been diminished as a consequence of the impairment of the ground water quality.



Small Well with Pressure Tank

Locally, small domestic wells are the only source of supply for the isolated or small rancher.

The older alluvium is usually exposed as erosional remnants in stream-cut terraces along the sides of valleys. It is principally recharged by deep penetration of direct rainfall and percolation of streamflow originating in the watershed. Older alluvium is generally considered to be moderately permeable and a good source of ground water where it is not cemented or elevated above the water table.

The continental sediments which occur in the Pala-Pauma, Temecula-Murrieta, Warner Springs, and Aguanga areas are important sources of ground water and are tapped by many wells. These sediments (Pala Fanglomerate, Pauba and Dripping Springs Formations, and Temecula Arkose) have coarse-grained phased that are moderately to highly permeable and fine-grained

phases, which have low to moderate permeability. Recharge of these sediments is principally from deep penetration of direct rainfall, runoff, and return irrigation waters, and from underflow from adjoining areas. The continental sediments are generally a good source of ground water. Some of the wells extracting ground water from the Temecula Arkose, for example, produce in excess of 1,500 gallons per minute.

The Linda Vista and Bay Point Formations and related unnamed Pleistocene marine and nonmarine sandstones, siltstones, and conglomerates generally occur in the coastal plain. They are usually less than 300 feet thick. As a rule, these sediments usually occur above the water table and are generally nonwater bearing. Permeability is variable and, where cementation by iron oxides has occurred, the sediments are relatively impermeable. In general, however, rocks of this group readily permit percolation of rainfall and runoff to the underlying sediments.

Pre-Quaternary Sediments. The major water-bearing Tertiary sediments are the San Diego and La Jolla Formations and, to a lesser degree, the Poway Conglomerate. The most favorable source of water in these rocks is the coarser strata. Recharge is mainly from direct percolation of rainfall and runoff and from percolation of water from overlying or adjacent permeable sediments.

Wells in the San Diego Formation are generally deep, with some penetrating to depths of more than 1,000 feet. The La Jolla Formation has been drilled extensively, although amounts of water produced have been generally small to moderate. Some production is also obtained from the Poway Conglomerate and Capistrano and San Mateo Formations, but yields from wells have been highly variable.

Crystalline Rocks and Residuum. The water-bearing characteristics of crystalline rocks depend on the degree of weathering, the presence of fracture and joint patterns, the structure, and the rock type. Unweathered and unfractured crystalline rocks generally have a porosity of less than 1 percent and a permeability so small as to be almost negligible. In the San Diego Region, however, these rocks usually display a well developed joint and fracture pattern. This enhances the rate and degree of weathering.

The weathered product, called residuum, is found to some degree in the crystalline rock areas throughout much of the San Diego Region. It is discussed in this section because of its inseparable relation with the parent crystalline rock.

Depending on the extent of weathering (decomposition and disintegration), varying quantities of ground water can be stored within the interstitial openings of residuum. Its permeability is considered to be low and, although the yield of wells in residuum is comparatively small, it is locally an important source of water.

Principal recharge of residuum is by deep penetration of direct rainfall and percolation of streamflow originating in the watershed. However, in many of the highland areas, the residuum lies generally above the water table and is not a significant contributor to the ground water supply.

As discussed in Chapter II, the particular rock type is an important factor in determining the degree and depth of weathering. This, in turn, affects the water-bearing properties of the residuum. On this basis, assuming that all other factors are held constant, the residuum of the different rock types can be ranked according to the probability of obtaining reliable yields of water for individual domestic users. In decreasing order, they are generally tonalite, metamorphic rocks, gabbro, and granodiorite.

Tonalite, which has the largest areal extent of the crystalline rocks, is an even-grained rock that weathers to a friable sand-like soil with scattered boulders. The interstitial openings, resulting from the volume changes accompanying weathering, provide spaces for ground water.

Few problems are encountered in drilling, because this residuum is uniform and soft. Although wells in the residuum from other rock types may yield more water, the tonalite residuum is probably the most consistent producer.

The physical properties of metamorphic rocks are variable, but many of the rocks are schistose or slaty and have innumerable closely spaced joints. These properties, as well as the general absence of clayey alteration products, increase the permeability and storage capacity of the residuum from these rocks. However, the yield of water from this residuum is highly erratic and the success of a well depends largely upon local conditions and the particular metamorphic rocks involved. Although the metamorphic rocks may weather deeply, drilling may be difficult because of hard, slaty bands and quartzitic interbeds.

Most gabbros weather deeply. The resulting residuum is similar to that developed in tonalite, except that it is less uniform and may contain hard zones. The granodiorites generally have joints and fractures that are more widely spaced than those in the other crystalline rocks. This, plus the

fact that its weathering products are usually clayey, makes residuum from granodiorites generally an unreliable source of ground water.

In recent years, a general lowering of water tables has taken place because of increased pumping and a lack of precipitation. This has caused many wells in the residuum to go dry. To maintain the local domestic supply, the number of wells being drilled into unweathered crystalline rocks has increased. Even so, in some areas, as southeast of El Cajon, thick accumulations of residuum and fractured crystalline rock are still yielding significant quantities of water.

The fractures and joints in crystalline rock, which extend to considerable depths below the weathered zone, are capable of accumulating large quantities of water that can move through these openings. Recharge is by direct precipitation and run-off from adjoining areas.

The wells in crystalline rock yield from less than 1 up to about 400 gallons per minute, depending upon the extent of fractures and joints, and the number of laterals (horizontal collectors) drilled. The average depth of a well in crystalline rock is roughly 200 to 250 feet, with some wells extending to 600 feet. Average cost of these wells is \$2,000 to \$2,500, but costs as high as \$10,000 are not uncommon.

Water Levels

In general, the water table in the Region occurs at depths less than 50 feet below the ground surface, and in many areas, less than 25 feet below the surface (Plates 8A, 8B, and 8C). There are local exceptions, such as in the Pala and Pauma Valleys, the Murrieta area, and the inland portion of the Tia Juana and San Luis Rey Rivers, where the ground water levels are 75 feet to more than 100 feet below the surface.

As may be seen in Figure 6, water levels at selected wells have decline approximately 30 to 70 feet since 1945. This decline in water levels appears to be generally related to the decline in precipitation, coupled with an increased use of ground water due to population growth (Figure 4), which has resulted in a reduction of water in storage. Topography also is a major factor influencing the level of the water table. For example, depths to water in the mesa areas of the Tia Juana River Valley are greater than 500 feet because of their position relative to the floor of the river valley. In addition, the water table generally reflects, in subdued form, the configuration of the ground surface because of the influence of topography on recharge and movement. Man's activities,

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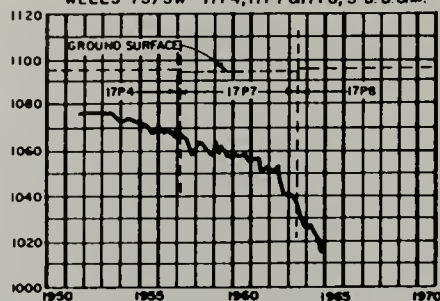
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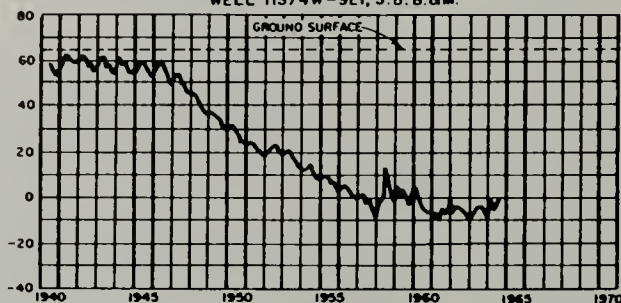
MURRIETA HYDROLOGIC SUBUNIT (Z-02.CO)

WELLS 7S/3W-17P4, 17P7 & 17P8, S.B.B.&M.



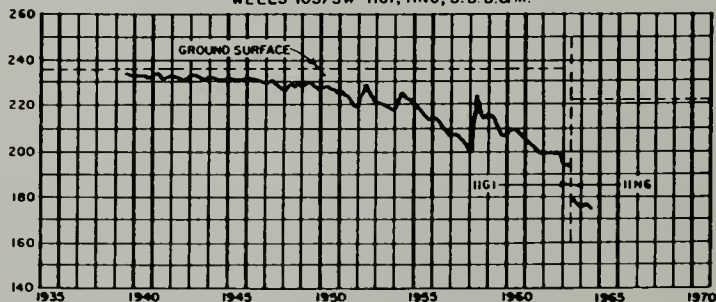
BONSALL HYDROLOGIC SUBUNIT (Z-03.A0)

WELL 11S/4W-9E1, S.B.B.&M.



BONSALL HYDROLOGIC SUBUNIT (Z-03.A0)

WELLS 10S/3W-11G1, 11G6, S.B.B.&M.



TIA JUANA HYDROLOGIC SUBUNIT (Z-11.A0)

WELLS 19S/2W-4A13, 4A6, S.B.B.&M.

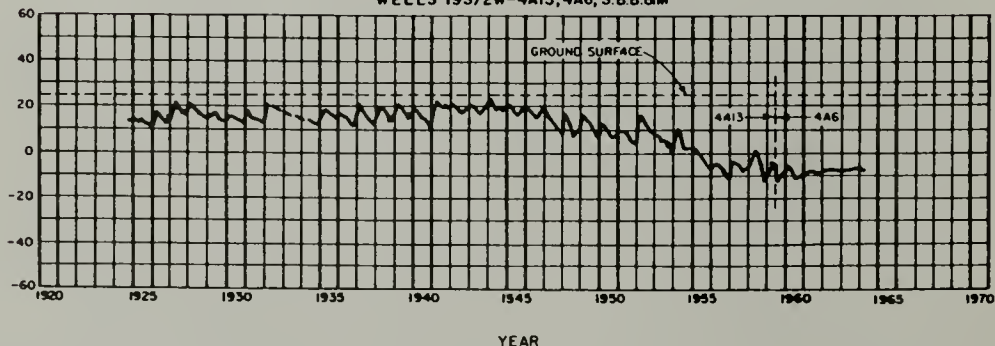


Figure 6 – HYDROGRAPHS OF GROUND WATER AT SELECTED WELLS IN THE SAN DIEGO REGION

as evidenced by overpumping, have also affected water levels and resulted in an overdraft of the ground water reservoirs. In some of the alluvium-filled coastal valleys, water levels have been drawn down as much as 50 feet below sea level with resulting sea-water intrusion and connate-water invasion (Plate 7).

The general lowering of water levels in the Region has resulted in increased costs of well drilling and ground water extractions. In particular, the unit cost of obtaining ground water in many areas has increased because of drilling deeper wells in residuum or because of increased drilling in fractured and jointed crystalline rocks.

Well Production

Ground water production or yield by wells in the major alluvial valleys of the San Diego Region depends primarily on the capacity of the water-bearing materials to transmit water, thickness of the water-bearing strata, and physical characteristics, number, and distribution of water wells.

An important consideration affecting the yield of wells in residuum is the development of laterals (horizontal collectors). The primary purpose of these lateral drill holes is to increase the flow of water to the vertical well. Wells with laterals produce the largest yields when they penetrate residuum of considerable depth and when they are situated in favorable topographic positions.

Generally, the yield of wells in the crystalline rocks is small with a large percentage of those drilled failing to intersect water-bearing fractures. The most favorable sites for hard rock wells is where drainage from surrounding slopes can supply sufficient recharge to the rock fissures.

A general summary of the rate of initial well production of ground water from: (1) alluvium and Pleistocene sediments, (2) pre-Quaternary sediments, and (3) residuum and fractured crystalline rocks is shown in Figure 7. The percent of wells within a range of production for a given rock type is obtained by dividing the number of wells within this range by the total number of producing wells. Figure 7 is based on the rate of initial production from approximately 200 wells and is considered to be representative of the Region.

As is shown, wells drilled in alluvium and Pleistocene sediments or in pre-Quaternary sediments have had initial productions that ranged from nearly zero to more than 1,000 gallons per minute. However, according to the records of wells drilled,

alluvium and Pleistocene sediments more often have yielded the larger amounts, while the pre-Quaternary sediments have had a lower, more variable initial production.

Wells drilled in residuum and fractured crystalline rocks show a narrower range of initial production than the other rock types. The data indicate that residuum would be an unlikely source for a continuous supply of water sufficient for extensive irrigation or major domestic purposes. More than 65 percent of wells drilled in residuum and fractured crystalline rocks fell within the production range of nearly zero to 25 gallons per minute. Nonetheless, the residuum is a good source of water (assuming sufficient recharge and proper development of wells) for local domestic uses.

Imported Water

The coastal section of the San Diego Region, excluding Camp Pendleton, relies essentially on imported water as a source

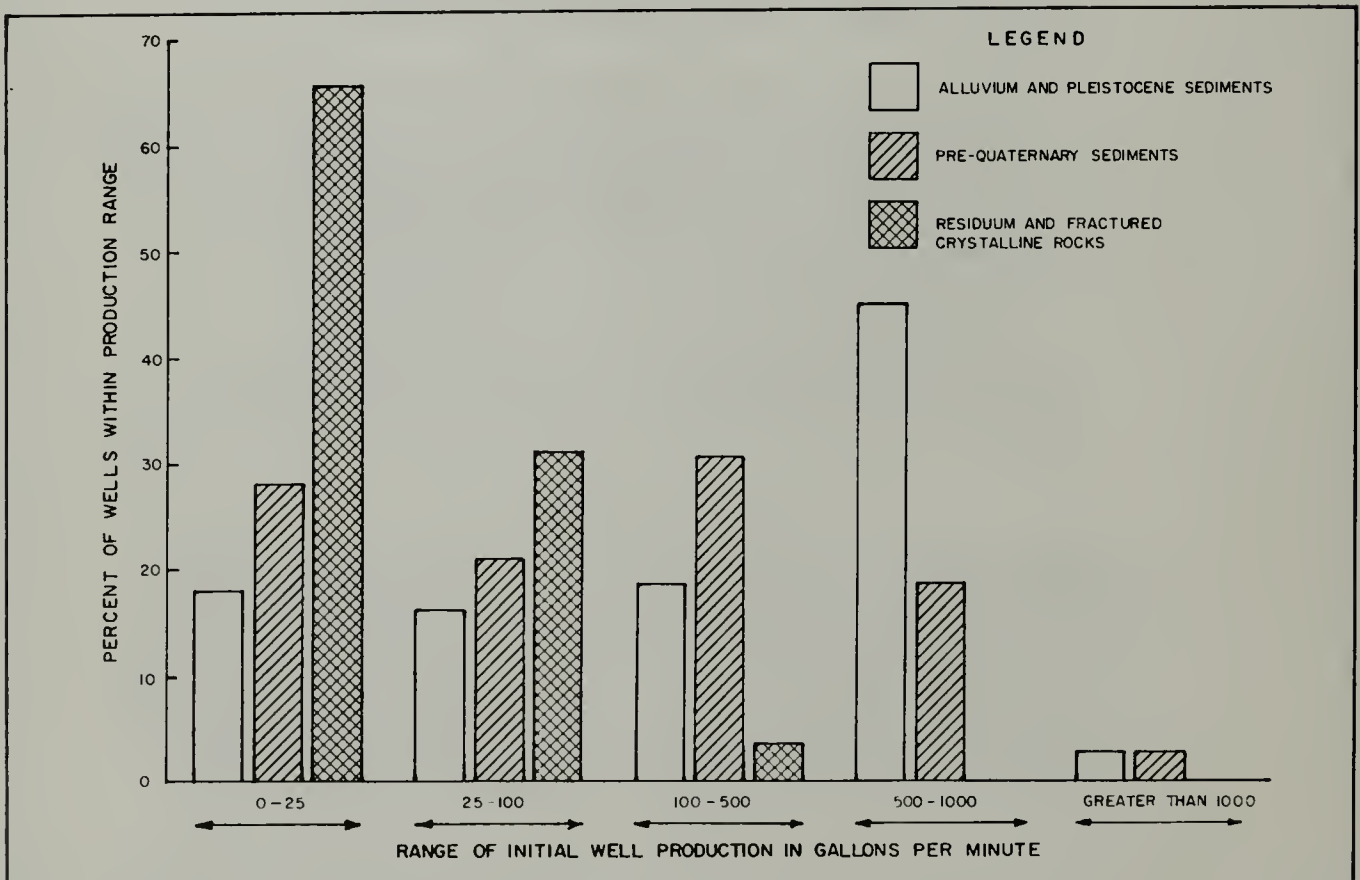


Figure 7 - RATE OF INITIAL WELL PRODUCTION FROM SELECTED SOURCES



San Diego County Water Authority

Construction of
Second Barrel of
First Aqueduct,
1953

of supply and derives only minor amounts from local production. Generally speaking, the local water supply, even under ideal conditions, is a limited source. With increasing demand, importation of water becomes unavoidable if growth in the San Diego Region is to continue.

In November 1947, the first barrel of the First San Diego Aqueduct commenced to deliver Colorado River water. It was constructed by the U. S. Navy as an emergency measure to meet the increased demand for water caused by accelerated population growth which accompanied the rapid expansion of military and industrial facilities during World War II. In 1954, the second barrel was completed, bringing the total capacity of the first aqueduct to 196 cubic feet per second. Ownership and operation were then assumed by the San Diego County Water Authority.

Increasing demands for water necessitated the construction of the first barrel of the Second San Diego Aqueduct by The Metropolitan Water District of Southern California and the San Diego County Water Authority. This barrel, with a capacity of 250 cubic feet per second, was completed in 1960. The combined capacity of both aqueducts is 446 cubic feet per second; however, projections of needs by the San Diego County Water Authority indicate that a second barrel of the Second Aqueduct, with a capacity of 430 cubic feet per second, will be needed by about 1970.

In southern Orange County, San Juan Capistrano and San Clemente started receiving deliveries of imported Colorado River water from the member municipalities of the Metropolitan Water District between April and June 1964. In the upper reaches of Arroyo Trabuco, importation of Colorado River water began in July 1964 as a supplement to the local supply.

A summary of imported and local water production is shown in Table 4. The increase in the amount of imported water and

the relative reduction in local production may be readily seen. For the fiscal year 1963-64, about 233,800 acre-feet of Colorado River water were imported, and from 1947-48 through 1963-64, a total of about 2,043,100 acre-feet had been imported into the Region. Local production in the area serviced by the San Diego County Water Authority amounted to only about 10 percent of the water supply. But for the whole Region, local sources made up about 20 percent, or 56,700

TABLE 4
ESTIMATED LOCAL AND IMPORTED WATER PRODUCTION
IN SAN DIEGO REGION

In acre-feet

Fiscal year	: Sales of : Colorado : River water :	: Local : production* :	: Total : supply :	: Local : production, : as percent of : total supply
1947-48	41,000	105,600	146,600	72
1948-49	71,600	79,100	150,700	52
1949-50	58,600	65,400	124,000	53
1950-51	81,800	49,000	130,800	38
1951-52	62,100	65,100	127,200	51
1952-53	32,600	104,400	137,000	76
1953-54	73,200	117,100	190,300	62
1954-55	102,700	88,600	191,300	46
1955-56	136,700	71,500	208,200	34
1956-57	149,000	62,800	211,800	30
1957-58	143,900	61,500	205,400	30
1958-59	100,300	105,900	206,200	50
1959-60	159,600	90,800	250,400	36
1960-61	191,500	54,200	245,700	22
1961-62	183,700	51,900	235,600	22
1962-63	221,000	52,800	273,800	19
1963-64	<u>233,800</u>	<u>56,700</u>	<u>290,500</u>	<u>20</u>
TOTALS	2,043,100	1,282,400	3,325,500	39

*Includes ground water and runoff based on DWR Bulletin No. 78-D, DWR Bulletin No. 70, and Annual Reports of San Diego County Water Authority.

acre-feet, of the total supply for the fiscal year 1963-64, as compared to 72 percent, or 105,600 acre-feet, for 1947-48.

However, it should be noted that approximately one-half of the local production for 1963-64 was obtained from southwest Riverside County and southeast Orange County -- an area which contains less than 5 percent of the total population of the San Diego Region.



Santee Project,
May 1965

Photograph by B. A. Gustafson
for U. S. Public Health Service

The Santee County Water District operates a planned reclamation system of several small lakes which are used for recreation.

POTENTIAL SOURCES OF SUPPLY

Potential sources of water, in addition to Colorado River water, runoff, and ground water, are reclaimed waste water, desalinized sea water, and water imported through the State Water Project.

The waste water treatment facilities in the San Diego Region discharged about 83,700 acre-feet of effluent during the fiscal year 1963-64 (DWR report on "Quantity, Quality, and Use of Waste Water in Southern California", April 1966). Of this total, about 67,900 acre-feet were discharged to the ocean and the remainder inland. Approximately 15,300 acre-feet of the water discharged inland were reclaimed during 1963-64; of this quantity about one-half was planned reclamation. In many cases, it was "involuntary reclamation", with waste water commingling with water from other sources, as in lakes, streams, or percolation to the ground water reservoirs.

An example of the potentialities of planned waste water reclamation may be seen at Santee, within the drainage of the San Diego River. Here, the Santee County Water District operates a planned reclamation system of several small lakes which are used for recreation. DWR Bulletin No. 80-2, "Reclamation of Water from Wastes in Coastal San Diego County" (Preliminary Edition) February 1966, is a report on the feasibility of reclaiming waste water for beneficial uses in coastal San Diego County.

Another potential source of water is desalination. A plant, in part financed by the Department and operated on an experimental basis, was dedicated March 10, 1962, at Point Loma. This plant, while in operation, supplemented the City of San Diego's water supply. It had a capacity of one million gallons per day. In June 1964, the Point Loma plant was dismantled and shipped to Guantanamo Naval Base, Cuba.

With the passage of the Cobey-Porter Saline Water Conversion Bill and a companion bill in 1965, the Department was enabled to cooperate with the U. S. Office of Saline Water in planning the San Diego Saline Water Test Facility. This facility will be constructed in Chula Vista on San Diego Bay in two phases. Phase I, which will replace the dismantled Point Loma plant, is scheduled to go into operation in the early summer of 1967. It will consist of a one-million-gallon per day advance design flash distillation plant. Phase II will consist of test facilities which will produce up to three million gallons per day. It is scheduled for completion one year later and will be used for the testing of full-scale modules and components of saline water conversion plants. This water will be delivered by the Department to a local water entity for distribution.



Point Loma Desalinizing Plant,
March 1962

California Division of Highways

While in operation, the plant supplemented
the City of San Diego water supply.

A future source of supply for the San Diego Region is Northern California water via the State Water Project. The Metropolitan Water District of Southern California has contracted with the State of California for a maximum annual entitlement of 2,011,500 acre-feet from the State Water Project. The San Diego County Water Authority, a member of the Metropolitan Water District, will receive supplemental water from this source in 1972. This imported water may be distributed by surface conveyance facilities to the populace or utilized directly to recharge the ground water reservoirs.

In the future, use of supplemental waters, such as imported Northern California water, could help alleviate overdraft conditions of the ground water reservoirs. Thus, the encroachment of saline waters could be halted and normal seaward hydraulic gradients be reestablished in the coastal alluvium-filled valleys.

CHAPTER IV. WATER QUALITY

The purpose of this chapter is to show what measurements, evaluations, and criteria were used by the investigators to determine the quality of the water in the San Diego Region. To carry out this purpose, the investigators, using information collected in the water quality surveillance program which the Department maintains, evaluated the chemical constituents within the water and established meaningful criteria for rating it.

This chapter describes the common chemical constituents and their occurrence. The next chapter will deal in detail with the factors within the environment -- both natural and manmade -- that determine the quality of the water. In the final chapter, information will be given on the quality of water in the individual hydrologic units of the Region.

CHEMICAL CONSTITUENTS AND PROPERTIES

Of primary importance in making a water quality study is the determination of the chemical constituents and properties inherent in the water and, of these, which are significant (see Appendix D).

In the San Diego Region, as elsewhere, the kinds and amounts of chemical constituents in water are governed by the types of rock material and soils with which it comes in contact.

Precipitation and runoff also generally govern the concentration of constituents in water by the mechanism of dilution. Water containing the smallest quantities of dissolved constituents is usually found in areas having the greatest amount of precipitation and runoff, particularly where such areas are underlain by crystalline rocks.

The chemical constituents and properties commonly occurring in surface and ground water in the San Diego Region are discussed in the following section. These include calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, nitrate, boron, electrical conductivity, total dissolved solids, radioactivity, and chemical character.

Calcium (Ca)

Calcium can be dissolved from most rocks, but the highest concentrations of calcium in the San Diego Region are usually in waters that have been in contact with the more basic intrusive rocks or with gypsiferous sedimentary rocks.



Sampling Ground Water from Pressurized Well System

The Department collects information
in its water quality surveillance program.

For irrigation, especially of clayey soils, calcium should form a high percentage of the cations so that the irrigated soil will be arable and permeable. In contrast, calcium should not be present in high concentrations in water used for domestic and industrial purposes because it is the principal cause of hardness and scale in boilers and water pipes. Calcium also reacts with soap, producing a gray scum that inhibits lathering.

Magnesium (Mg)

In the Region, waters relatively rich in magnesium are generally associated with the more basic crystalline rocks such as the gabbros. Magnesium increases the hardness of water and the scale-forming properties in the same manner as does calcium. Also, water containing about 125 parts per million of magnesium and about 500 parts per million of sulfate may

produce a noticeable laxative effect in persons unaccustomed to these concentrations in their drinking water.

Sodium (Na) and Potassium (K)

In the San Diego Region, sodium and potassium are dissolved from most rock materials. However, the sodium concentration generally far exceeds the potassium concentration in surface and ground water. Although potassium is present in most of the crystalline rocks, its concentration in surface and ground water is negligible as compared to the other major cations. This anomaly is due to the weathering characteristics of the various rocks and to the recombining of potassium released from these rocks with the clayey products of weathering.

Moderate quantities of sodium and potassium generally have only a small effect on the usefulness of water. However, industrial use of water containing moderately high concentrations of sodium and potassium may require that steam boilers be carefully operated to prevent foaming.

For laundry and cleaning purposes, it is desirable that sodium make up a high percentage of the cations because calcium and magnesium cause formation of soapy scums in household washing and deposition of scale in hot water pipes. For irrigation use, water should have a low ratio of sodium to total cations. Irrigation water with a high percent sodium decreases soil permeability by deflocculation, thereby reducing percolation to the plant root zone.

Carbonate (CO_3) and Bicarbonate (HCO_3)

The bicarbonate anion is normally the predominant anion in much of the native waters of the San Diego Region. Carbonate and bicarbonate are derived principally from the atmosphere and vegetation-covered lithosphere. Carbon dioxide in the atmosphere combines with moisture to form carbonic acid which aids in the rock weathering processes. Carbonic acid in solution dissociates to form bicarbonate ions that link with the cations released from weathering of the lithosphere. The relative concentrations of these two constituents affect the alkalinity or acidity (pH) of the water.

Sulfate (SO_4)

The most important sources of sulfate in native waters of the San Diego Region are the gypsiferous deposits and sulfide

minerals associated with the crystalline rocks. Sulfate is particularly significant in water that contains large concentrations of calcium and magnesium. In combination with calcium and magnesium, sulfate forms deposits of hard scale in water pipes, water heaters, and boilers. Sulfate in combination with magnesium may produce laxative effects.

Chloride (Cl)

Most waters contain chloride because it is present in many rock types and is very soluble in water. All waters in the study area contain chloride that has been dissolved from rocks or has been derived from hot springs of deep-seated origin. In the coastal areas, high concentrations usually signify sea-water intrusion or inflow of connate waters from the Tertiary marine sediments or both. In addition, disposal of sewage and industrial wastes often introduces chloride into surface and ground waters.

High concentrations of chloride render water unusable for drinking or for processing of foods and beverages. For irrigation, water containing high chloride concentrations is undesirable because chloride causes subnormal growth of crops and burns the foliage, impairing the appearance and reducing the marketability of the crops.

Nitrate (NO₃)

Nitrate generally occurs only in trace quantities in nonpolluted water. Where it occurs in amounts exceeding a few parts per million in the San Diego Region, it is usually derived from by-products of organic decomposition and from chemical fertilizers. In addition, large quantities of nitrate result from nitrogen fixation by bacteria and plant legumes. Atmospheric storms also cause the fixation of nitrogen, and subsequent precipitation carries the nitrates into the soil.

In excessive amounts, 45 ppm or more, high nitrate concentrations in water used for preparing infant's feeding formulae may cause the infant illness methemoglobinemia (cyanosis).

Boron (B)

Boron usually occurs as a trace in nonpolluted waters. It is a major constituent of the mineral tourmaline which is widespread in the pegmatitic veins associated with igneous rocks. Also, some hot springs in the Region contain 2 to 4 ppm of boron.

The concentration of boron in water for agriculture is important. Boron in excess of 2 ppm in irrigation water is deleterious to many plants; less than 1 ppm adversely affects others. However, trace amounts are essential to the growth of many plants.

Electrical Conductivity (EC)

Electrical conductivity, which is expressed in micromhos at 25° C, is a quick method of measuring the ion concentration of a solution. Electrical conductivity is used as an indication of the total dissolved solids content of water.

Total Dissolved Solids (TDS)

The areal extent of total dissolved solids in ground water in the San Diego Region is shown on Plates 9A, 9B, and 9C, and for selected surface water stations on Plate 10. These plates are discussed in Chapter V and reviewed in Chapter VI.

Determination of the concentration of total dissolved solids in water furnishes an indication of its overall chemical content and serves as a criterion for appraising the chemical quality of water for beneficial uses.

For domestic use, waters are classified according to total dissolved solids content, which may be estimated from the electrical conductivity. For most waters, multiplying electrical conductivity by a factor of 0.5 to 0.7 gives a number that approximates the total dissolved solids content.

Radioactivity

The U. S. Public Health Service defines radioactivity as ionizing radiation that is harmful to the human body. Mankind has always been exposed to natural and background radiation. Any increase of radiation in the water supply above background could be a hazard to the public health.

The most common unit of measurement is the "curie"; however, the term "picocurie" per liter (pc/l) of water is used in this report. A picocurie is equal to a micro-microcurie (uuc) which is a millionth of a millionth of a curie, or approximately 2.22 disintegrations per minute. Naturally occurring radioactive concentrations in surface waters are very low, varying from about 0.10 to 10 picocuries per liter.

The following limits on radioactivity are taken from the Federal Register, Title 42-Public Health, dated March 6, 1962,

and are given here as a guide to the reader for evaluating the radioactivity results from selected stations presented in Table 5.

"Limits. (1) The effects of human radiation exposure are viewed as harmful and any unnecessary exposure to ionizing radiation should be avoided. Approval of water supplies containing radioactive materials shall be based upon the judgment that the radioactivity intake from such water supplies when added to that from all other sources is not likely to result in an intake greater than the radiation protection guidance recommended by the Federal Radiation Council and approved by the President. Water supplies shall be approved without further consideration of other sources of radioactivity intake of Radium-226 and Strontium-90 when the water contains these substances in amounts not exceeding 3 and 10 ucc/liter, respectively. When these concentrations are exceeded, a water supply shall be approved by the certifying authority if surveillance of total intakes of radioactivity from all sources indicates that such intakes are within the limits recommended by the Federal Radiation Council for control action.

"(2) In the known absence of Strontium-90 and alpha emitters, the water supply is acceptable when the gross

TABLE 5
RADIOASSAYS OF SURFACE WATER FROM
SELECTED STATIONS IN SAN DIEGO REGION

Sampling station*	:	:	Picocuries per liter					
			Date		Dissolved		Solid	
Stream system	Number	sampled	alpha	alpha	beta	beta	beta	beta
Santa Margarita River near Fallbrook	S-15	5-15-64	0.28± 0.93	-0.05±0.80	-8.55± 8.70	13.52± 9.07		
		9-18-64	2.86± 3.51	-0.57±0.48	-0.79±13.12	1.53± 7.93		
Escondido Creek near Harmony Grove	S-26	5-14-64	4.53± 7.18	0.73±1.35	9.65±15.84	-3.54± 9.17		
		9-17-64	3.48± 9.53	0.59±1.03	20.89±14.70	2.54± 7.86		
San Diego River at Old Mission Dam	S-40	5-13-64	-3.55± 1.36	2.43±2.16	10.06±15.25	-4.47± 9.85		
		9-15-64	-4.53± 2.09	0.29±0.80	0.31±16.09	3.72± 6.91		
San Diego River near Mission Gorge Road	S-41	5-13-64	3.68± 5.82	0.02±0.74	13.61±15.52	1.32± 7.95		
		9-15-64	4.09± 13.36	0.07±0.71	12.91±29.90	-3.57± 6.47		
Spring Valley Creek near La Pressa	S-46	5-14-64	58.79±107.92	-0.03±0.77	-42.98±76.62	0.48± 8.39		
		9-15-64	4.88± 29.71	0.99±1.04	-47.97±79.76	10.72± 8.99		
Tia Juana River at International Boundary	S-53	5-14-64	0.91± 7.00	5.44±5.17	80.89±35.76	13.81±47.38		

*See Plate 10 for location.

beta concentrations do not exceed 1,000 uuc/liter. Gross beta concentrations in excess of 1,000 uuc/liter shall be grounds for rejection of supply except when more complete analyses indicate that concentrations of nuclides are not likely to cause exposures greater than the Radiation Protection Guides as approved by the President on recommendation of the Federal Radiation Council."

Chemical Character

The chemical character of water is based on the determination of the predominant cations and anions in equivalents per million (epm). Specifically, the name of an ion is used where its chemical equivalent constitutes one-half or more of the total ions for its appropriate group. For example, sodium chloride water is water in which the sodium is equal to or greater than 50 percent of the cations and the chloride bears a like relationship to the anions. Also, sodium-calcium chloride water is water in which sodium, the major ion, is more abundant than calcium, the subordinate ion, but is less than 50 percent of the total cations. Likewise, sodium chloride-sulphate water is water in which chloride exceeds sulphate but is less than 50 percent of the total anions. The chemical character of a water is an important tool for tracing the factors influencing water quality. The chemical character of surface water in the San Diego Region is shown on Plate 10 and of ground water on Plates 11A, 11B, and 11C. These plates are discussed in Chapter V and Chapter VI.

QUALITY CRITERIA

Equally as important as determining the chemical constituents and properties of the water is establishing criteria, against which to measure those constituents and properties. Because of the different needs of each, separate sets of criteria have been developed for domestic and municipal use and for irrigation use.

Given here are the criteria that have been established for judging water in most locations. Following that discussion, specific criteria are presented in this bulletin that have been developed for use only in the San Diego Region.

General Criteria

The water quality criteria that are used in this investigation and report are based on the U. S. Department of Health,

Education, and Welfare "Public Health Service Drinking Water Standards, 1962"; the California State Board of Public Health "Interim Policy on Mineral Quality of Drinking Water"; and the classification of water for irrigation purposes by Dr. L. D. Donneen of the Division of Irrigation of the University of California at Davis.

TABLE 6

U. S. PUBLIC HEALTH SERVICE
DRINKING WATER STANDARDS
1962

In milligrams per liter
(ppm)

Substance	: Recommended : limits of : concentrations	: Mandatory : limits of : concentrations
Alkyl benzene sulfonate (ABS)	0.5	--
Arsenic (As)	0.01	0.05
Barium (Ba)	--	1.0
Cadmium (Cd)	--	0.01
Carbon chloroform extract (CCE)	0.2	--
Chloride (Cl)	250	--
Chromium (hexavalent) Cr ⁺⁶	--	0.05
Copper (Cu)	1.0	--
Cyanide (CN)	0.01	0.2
Fluoride (F)	(*)	(*)
Iron (Fe)	0.3	--
Lead (Pb)	--	0.05
Manganese (Mn)	0.05	--
Nitrate (NO ₃)**	45	--
Phenols	0.001	--
Selenium (Se)	--	0.01
Silver (Ag)	--	0.05
Sulfate (SO ₄)	250	--
Total dissolved solids (TDS)	500	--
Zinc (Zn)	5	--

*Refer to following sections on fluoride.

**In areas in which the nitrate content of water is known to be in excess of the listed concentration, the public should be warned of the potential dangers of using the water for infant feeding.

To aid readers in interpreting the chemical analyses of ground water presented in Appendix D and in evaluating the suitability of a particular water for a specific purpose, the Department of Water Resources has adopted for this report only a set of water quality use ratings based upon the standards and classifications mentioned above. The development of such use ratings from the U. S. Public Health Service Standards for domestic and municipal use, and from the University of California irrigation criteria are discussed in this section.

Domestic and Municipal Use

Water that is used for drinking and culinary purposes should (1) be clear and colorless; (2) have no unpleasant taste and odor; (3) be free from toxic substances; (4) contain a relatively low level of dissolved chemical constituents; and (5) be free from pathogenic organisms. The most widely used criteria in determining the suitability of a water for this use are the "Public Health Service Drinking Water Standards, 1962". These standards establish mandatory limits of maximum permissible concentration for certain constituents and nonmandatory but recommended limits for others. Table 6 indicates these limits for drinking water.

In California, the State Board of Public Health issues water supply permits in accordance with its "Interim Policy on Mineral Quality of Drinking Water", as adopted September 4, 1959, and in accordance with "Policy Statement and Resolutions by the State Board of Public Health with Respect to Fluoride Ion Concentrations in Public Water Supplies", as approved August 22, 1958. The interim policy on mineral quality is presented as follows:

- "1. Water supply permits may be issued for drinking and culinary purposes only when the Public Health Service Drinking Water Standards of 1946^{1/} and the State Board of Public Health policy on fluorides are fully met.
- "2. In view of the wide variation in opinion in this field, the uncertainty as to the long-time health effects, the uncertainty of public attitude concerning various mineral levels, and the obvious need for further study, temporary permits may be

^{1/}Author's Note: It is assumed, in the absence of any later proclamation, that the 1962 edition of the Drinking Water Standards now applies.

issued for drinking water supplies failing to meet the Drinking Water Standards if the mineral constituents do not exceed those listed under the heading 'Temporary Permit' in the following table:*

UPPER LIMITS OF TOTAL SOLIDS** AND
SELECTED MINERALS IN DRINKING WATER
AS DELIVERED TO THE CONSUMER

	Permit	Temporary Permit
Total Solids	500 (1,000)***	1,500 parts per million
Sulphates	250 (500)***	600 " " "
Chlorides	250 (500)***	600 " " "
Magnesium	125 (125)	150 " " "

*This interim policy relates to potable water and is not intended to apply to a secondary mineralized water supply intended for domestic uses other than drinking and culinary purposes.

**Waters having less than 32 milliequivalents per liter of dissolved minerals or 1,600 micromhos electrical conductance will usually have less than 1,000 parts per million total solids.

***Numbers in parentheses are maximum permissible, to be used only where no other more suitable waters are available in sufficient quantity for use in the system.

"3. Exception: No temporary permit for drinking water supplies in which the mineral constituents exceed those listed under the heading 'Temporary Permit' as set forth in #2 above may be issued unless the Board determines after public hearing:

(a) The water to be supplied will not endanger the lives or health of human beings; and

(b) No other solution to meet the local situation is practicable and feasible; and

(c) The applicant is making diligent effort to develop, and has reasonable prospect of developing a supply of water which will warrant a regular permit within an acceptable period of time.

The burden of presenting evidence to fulfill the requirements as set forth in (a), (b), and (c) above is upon the applicant".

With respect to fluoride concentration, the State Board of Public Health has defined the maximum safe amounts of fluoride ion in relation to mean annual air temperature.

Mean annual air temperature, in °F	Mean monthly maximum fluoride ion concentration, in ppm
50	1.5
60	1.0
70 - above	0.7

The mean annual air temperature of the San Diego Region generally falls within a range of 58° to 66° Fahrenheit.

Irrigation Use

Because of diverse climatological conditions, crops, and soils in California, it has not been possible to establish rigid limits for the quality of irrigation water to be used for all conditions involved. However, based on work done at the University of California and at the Rubidoux Regional Salinity Laboratories of the U. S. Department of Agriculture, water used for irrigation has been divided into three broad classes: Class 1, excellent to good; Class 2, good to injurious; and Class 3, injurious to unsatisfactory. Dr. L. D. Doneen has

TABLE 7

CRITERIA* FOR IRRIGATION WATERS

Factor	: Class 1 (excellent to good)	: Class 2 (good to injurious)	: Class 3 (injurious to unsatisfactory)
Electrical conductivity, ECx10 ⁶ at 25° C	Less than 1,000	1,000 - 3,000	More than 3,000
Boron, ppm	Less than 0.5	0.5 - 2.0	More than 2.0
Chloride, epm	Less than 5	5 - 10	More than 10
Percent sodium	Less than 60	60 - 75	More than 75

*It should be noted that the applicability of these various criteria will be determined by type of crops and climatological and soil conditions.

suggested a classification for water to be used for irrigation as shown in Table 7; this classification is used by the Department of Water Resources in determining water quality criteria for irrigation waters. Four criteria are generally used, as outlined by Dr. L. D. Doneen's classification, to determine the suitability of water for irrigation use: electrical conductivity (EC micromhos at 25° C), boron concentration, chloride concentration, and percent sodium.

Specific Criteria

The water quality use ratings adopted by the Department of Water Resources for use only in this investigation are shown in Table 8. These ratings are not to be construed as recommended limits. In arriving at the use ratings shown, due consideration was given to such factors as chemical quality of water now being used, climate, soil, and crop types. In addition, physiological and aesthetic effects were considered for domestic use ratings. The availability of alternative sources has been, and continues to be, an important consideration in suggesting maximum limits on dissolved constituents in water in the San Diego Region. The limits set forth by the U. S. Public Health Service for toxic constituents, such as barium, lead, cyanide, cadmium, silver, arsenic, selenium, and hexavalent chromium, should be adhered to.

On the basis of the water quality criteria discussed in this chapter and the conditions prevailing in the Region, waters for domestic and irrigation use in the San Diego Region are classified in one of three categories: suitable, marginal, or inferior. The constituents and the limits of concentration of these for each of the three categories are shown in Table 8. The rating of ground water for domestic uses are presented in Plates 12A, 12B, and 12C, and for irrigation uses in Plates 13A, 13B, and 13C. A discussion of these water use ratings for each hydrologic unit is presented in Chapter VI.

Where waters are used for both industrial and domestic purposes, the mandatory limits for the toxic constituents as set forth in the U. S. Public Health Service Drinking Water Standards should apply. The large number of specific quality requirements of water for industrial use prohibits inclusion of a classification for industrial waters in this report.

TABLE 8
RATING OF WATER FOR DOMESTIC AND IRRIGATION USES

Factor or constituent	Rating*		
	Suitable	Marginal**	Inferior
<u>DOMESTIC</u>			
Total dissolved solids (TDS), ppm	Less than 1,000	1,000-1,500	Greater than 1,500
Nitrate (NO ₃), ppm	Less than 45	--	Greater than 45
Fluoride (F), ppm	Less than 1.0	1.0-1.5	Greater than 1.5
Sulfate (SO ₄), ppm	Less than 250	250-500	Greater than 500
<u>IRRIGATION</u>			
Electrical conductivity ECx10 ⁶ at 25° C	Less than 1,500	1,500-3,000	Greater than 3,000
Chloride (Cl), ppm	Less than 175	175-350	Greater than 350
Percent sodium	Less than 60	60-75	Greater than 75
Boron (B), ppm	Less than 0.5	0.5-2.0	Greater than 2.0

*These ratings are a general guide only. Interim standards for certain mineral constituents have been adopted by the California State Board of Public Health for domestic water supplies. Persons planning to serve water to the public should contact their local health department.

**The term marginal applies to waters that exceed the drinking water standards but could be used with appropriate restrictions. For irrigation uses, the term marginal is regarded as possibly being harmful for certain crops under certain conditions of soil or climate, particularly in the higher ranges of this class.

CHAPTER V. GEOHYDROCHEMISTRY

Geohydrochemistry is the study of the chemical quality of surface and ground water as it is influenced by the geologic and hydrologic environments and modified by the activities of man.

As has been generally recognized, the principal conditions that influence the kind and concentration of chemical constituents occurring naturally in surface and ground water are:

- (1) climatic conditions, such as the amount of precipitation and runoff -- a part of the hydrologic environment; and
- (2) chemical composition of the rocks that water encounters and the weathering process these rocks undergo -- a part of the geologic environment.

Among the major factors resulting from man's activities which may influence the chemical quality of water in the San Diego Region are: importation of Colorado River water, future use of Northern California water, use of reclaimed waste water and desalinized water, intrusion of sea water, invasion by connates, development of adverse salt balance condition, disposal of industrial and domestic waste, and application of chemical fertilizers.

EFFECTS OF PRECIPITATION AND RUNOFF

The geology and hydrology of the study area not only individually influence the water quality, but also influence each other in their effects upon it. For example, above normal precipitation and consequent above normal runoff generally result in reducing the concentration of the chemical constituents dissolved in runoff and eventually in ground water. The greater the precipitation, the greater is the effect of dilution. The greater the runoff, the shorter the time water is in contact with the underlying rocks and, therefore, the smaller the concentration of material that is taken into solution by surface water.

Precipitation has a very small quantity of material in solution because it has gone through a natural distillation process during evaporation from water and land surfaces. With respect to total dissolved solids content, precipitation is at one end of the scale and sea water is at the other. In other words, the total dissolved solids content is at a minimum in precipitation, increases during runoff, further increases in ground water, and reaches its maximum in sea water.

Precipitation, which acquires chemical substances while still in the atmosphere, dissolves relatively large quantities of

carbon dioxide and smaller amounts of other constituents. Carbon dioxide in combination with rainwater forms carbonic acid, a weak acid that greatly aids in dissolving the minerals which make up the rocks of the lithosphere. The quantities of constituents that water can dissolve depend mainly on the solubility of the rock and soil materials and the length of time the water is in contact with them.

After entering the soil and rocks, precipitation, which generally contains less than 10 ppm total dissolved solids, incorporates soluble constituents, both inorganic and organic. It derives additional carbon dioxide from humus and other sources.

The influence of precipitation on the rocks in the mountain-valley section is far greater than that in the coastal-plain section because of two major factors: (1) annual precipitation for the mountain-valley section ranges from about 15 inches on the lower slopes up to 45 inches on the summits, whereas precipitation on the coastal plain is generally less than 15 inches; and (2) the area of the mountain-valley section is much more extensive than that of the coastal plain and consequently receives more precipitation.

EFFECTS OF GEOLOGIC ENVIRONMENT

The major factors of the geologic environment which influence the chemical quality of natural waters within the San Diego Region are discussed in this section. Also discussed are the techniques used for determining these effects and the evaluation of these effects.

Factors Influencing Water Quality

The principal factors within the geologic environment which influence the constituents dissolved in surface and ground water are the chemical composition of the rocks and weathering processes which these rocks undergo and, to a lesser degree, the natural discharge of hot springs.

Weathering and Rock Composition

Water is a powerful weathering agent, especially when charged with carbon dioxide from the atmosphere and from humus of the lithosphere. Over a period of time, under a climatic environment such as in the mountain-valley section of the San Diego Region, water is able to break down nearly all rock-forming minerals. The products of weathering can be divided into two

groups: (1) soluble materials (that is, compounds of sodium, calcium, magnesium, and potassium) which are removed by circulating waters; and (2) residual materials (that is, alumina, iron oxides, and some silica) that accumulate at the site of weathering.

In the San Diego Region, the major crystalline rocks, as discussed in Chapter II, are tonalites, granodiorites, gabbros, and metamorphics. The chemical composition of these rocks was studied in detail by Larsen (1948). ✓ Their major chemical constituents are the oxides of silicon, aluminum, iron, calcium, sodium, and potassium. *See correction sheet in front of book.*

The dissolved constituents accumulated by runoff draining the crystalline mountainous areas of the Region are of relatively low concentration. They are largely derived from feldspathic materials and, to a lesser degree, from the ferromagnesian minerals which make up the crystalline rocks. The four major cations derived from these minerals which are normally found in natural waters, in general order of decreasing abundance, are calcium, sodium, magnesium, and potassium.

This relative order of abundance of cation concentration in waters of the San Diego Region is generally in close correlation with the source minerals which make up the rocks of the Region. This correlation is shown when the oxides of calcium, sodium, magnesium, and potassium are converted to their ionic form (see following section on Techniques Utilized in Evaluating Effects) from the average mineral analyses of rocks (Larsen, 1948).

The stability, or weathering characteristics, of the rock-forming minerals is also important in determining the rate they go into solution. For example, the ferromagnesian minerals break down more rapidly than do the feldspars. Of the feldspars, those rich in calcium and sodium weather more rapidly than do those that are rich in potassium. Therefore, calcium is generally the most abundant cation in the native waters of the San Diego Region.

Even though potassium is one of the four major cations in waters of the Region, it is the least abundant. It generally is present in concentrations of less than 10 ppm. Based on the chemical composition of the crystalline rocks, it should be of a higher concentration in the waters. This anomaly is probably due in large part to the relative solubilities of the major cations, adsorption of potassium ions from solution by ✓ clayey materials, and other complex physiochemical processes. *See correction sheet in front of book*

Adsorption is the adhesion (by physical or chemical forces) of molecules of gases or of ions or molecules in solution to the

surface of solid bodies with which they are in contact. Adsorption by the forces of chemical bonding rather than physical forces is termed chemisorption. Replacement of adsorbed ions by ions in solution is termed ion exchange. Most of the ion exchange reactions involve cations and are often referred to as base exchange (Hem, 1959). Adsorption is an important process in the removal or replacement of ions in waters of the San Diego Region.

Generally, calcium and magnesium ions in solution will replace adsorbed sodium on the exchange material as in a water softener system. However, the process is reversible as in the intrusion of a freshwater zone by sea water in which calcium and magnesium ions are released from their exchange positions and replaced by sodium ions.

During the weathering processes, potassium ions are adsorbed by clays and recombined to form new clay or mica-like minerals; whereas, a relatively higher proportion of the ions of calcium, sodium, and magnesium tend to remain in solution. Minerals and sediments having exchange capacity are widespread and abundant. Their role in altering the chemical composition of dissolved constituents in water is very important.

Hot Springs

Hot springs locally have a major influence on the ground water in the San Diego Region. Widely scattered, mineralized hot springs are generally associated with fault zones. The hot springs contain highly mineralized waters, which rise from great depths and mix with circulating ground waters of meteoric origin. This mixture, which may move laterally as well as vertically, is generally a moderately hot water containing relatively high concentrations of fluoride, boron, sodium, chloride, and sulfate.

Hot springs, such as Murrieta Hot Springs and San Juan Hot Springs, are characterized by : (1) a Na Cl character, (2) a pH ranging from 9 to 9.4, (3) a high concentration of fluoride ion (4 to 8 ppm), (4) a high percent sodium (about 96 percent), along with a carbonate ion (CO_3) concentration of 20 to 60 ppm, and (5) a TDS concentration of 300 to 750 ppm. These chemical characteristics of waters from hot springs are quite different from those of the ground water in the surrounding areas. The influence of hot springs on the ground water of the areas surrounding Murrieta Hot Springs is indicated on Plates 11A, 12A, and 13A. Ground waters which seem to be partially influenced by hot springs occur in other areas such as those in the vicinity of the community of Radec.

Techniques Utilized in Evaluating Effects

The chemical relationships between ground water and its enveloping geologic environment were studied using the following techniques:

1. Available chemical analyses of ground waters from the wells located in a particular rock type were selected on the basis of the areal geology and subsurface lithology maps.
2. Of the selected chemical analyses, any analysis which had a nitrate ion content generally greater than 5 parts per million was excluded because of probable influences of man.
3. From these selected chemical analyses, percent reactance values of ground water as related to its source host or rock were plotted on trilinear diagrams (Figures 8A, 8B, and 8C).
4. Percent reactance values for chemical analyses of ocean water, Murrieta Hot Springs, and Warner Hot Springs were also plotted on the trilinear diagrams for comparison.
5. For reference and comparison, rock chemical analyses were also plotted on the same diagrams. The same method of calculating the percent reactance value from the chemical analysis of ground water was also used for the chemical analyses of the following rock materials:

Average Woodson Mountain granodiorite (Larsen, 1948)
Average granodiorite (Daly, 1933)
Average Green Valley Tonalite (Larsen, 1948)
Average Bonsall Tonalite (Larsen, 1948)
Average quartz diorite (Daly, 1933)
Average San Marcos Gabbro (Larsen, 1948)
Average gabbro (Daly, 1933)
Temecula Arkose (Mann, 1955)

The plotting of water quality data on trilinear diagrams is a graphic method of presenting the chemical character of a water. Percent reactance values for either cations or anions or both were plotted on the trilinear diagrams. Each vertex represents 100 percent of a particular ion or combination of ions. The composition of the water with respect to cations or anions or both is indicated by a point plotted in its respective triangle on the basis of the percentages of the constituents present. The trilinear diagram (after Piper, 1944) represents an analysis plotted by three points. The cation and anion triangles occupy positions at the lower left and lower right with their bases aligned horizontally. The central portion of the diagram or third portion is the diamond-shaped upper field.

Each corresponding point in the cation and anion triangles is projected into the upper diamond-shaped field along a line parallel to the upper margin of the field. The point where the extensions intersect represents the composition of the water as shown by the relationships between the cations (sodium plus potassium and calcium plus magnesium) and the anions (carbonate plus bicarbonate and chloride plus sulfate). Thus, the chemical character of a water is visually illustrated by the use of trilinear diagrams.

The chemical character which would be expected from a water coming in contact with a given rock type is based on the cation chemical character of that rock. This character is determined from the percent by weight of the oxides of calcium (CaO), magnesium (MgO), sodium (Na₂O), and potassium (K₂O) as presented in the chemical analyses of that rock. However, the resulting cation chemical character does not take into consideration such factors as adsorption, weathering, and solubility of constituents which make up the lithosphere.

To determine the cation chemical character of a rock, the percent by weight of the oxides of the major cations found in water (i.e., Ca, Mg, Na, and K) is changed to its percent by weight in ionic form by multiplying by the following conversion factors: $\sqrt{\left(\frac{\text{atomic weight}}{\text{molecular weight}}\right) \frac{\text{Ca}}{\text{CaO}}} = 0.7146;$

$\frac{\text{Mg}}{\text{MgO}} = 0.6032; \frac{\text{Na}}{\text{Na}_2\text{O}} = 0.7419$ and $\frac{\text{K}}{\text{K}_2\text{O}} = 0.8320$. The ionic form of the cations is then equated to parts per million and converted to equivalents per million by dividing by the combining weights of calcium (20.04), magnesium (12.16), sodium (22.99), and potassium (39.10). The percent reactance value for each cation is then obtained by dividing each of the cations in equivalents per million by the sum of the cations to show the cation chemical character. *See correction sheet in front of book.*

The chemical character of water coming in contact with sedimentary rocks may be estimated by converting mineral analyses of these rocks to their chemical analyses form and then using the above procedures. This technique is useful not only for showing and interpreting relationships with the aid of trilinear diagrams, but also for estimating the cation chemical character of runoff and ground water coming in contact with a given rock type.

However, the cation chemical character which might be expected to occur in a water (based on a chemical analysis of its associated rock material), as previously discussed, is modified by the geologic and hydrologic environments. Chemical analyses indicate that some of the crystalline rocks in the San Diego Region are relatively high in potassium. Therefore,

LEGEND

CHEMICAL ANALYSES OF

- GROUND WATER FROM SOURCE ROCK
- SPRING WATER FROM SOURCE ROCK
- AVERAGE DETERMINATION OF WATER FROM SOURCE ROCK
- WATER FROM MURRIETA HOT SPRINGS
- WATER FROM WARNER HOT SPRINGS
- SEA WATER
- △¹⁻⁸ SOURCE ROCK-CATION DETERMINATION
- ▲¹⁻⁸ SOURCE ROCK-CATION DETERMINATION, POTASSIUM ION EXCLUDED FROM CALCULATIONS

SOURCE ROCKS (AS PER SUPERSSCRIPTS 1-8)

- 1 WOODSON MOUNTAIN GRANODIORITE
- 2 GRANODIORITE-WORLD AVERAGE
- 3 GREEN VALLEY TONALITE
- 4 BONSALE TONALITE
- 5 QUARTZ DIORITE (TONALITE)-WORLD AVERAGE
- 6 SAN MARCOS GABBRO
- 7 GABBRO-WORLD AVERAGE
- 8 TEMECULA ARKOSE

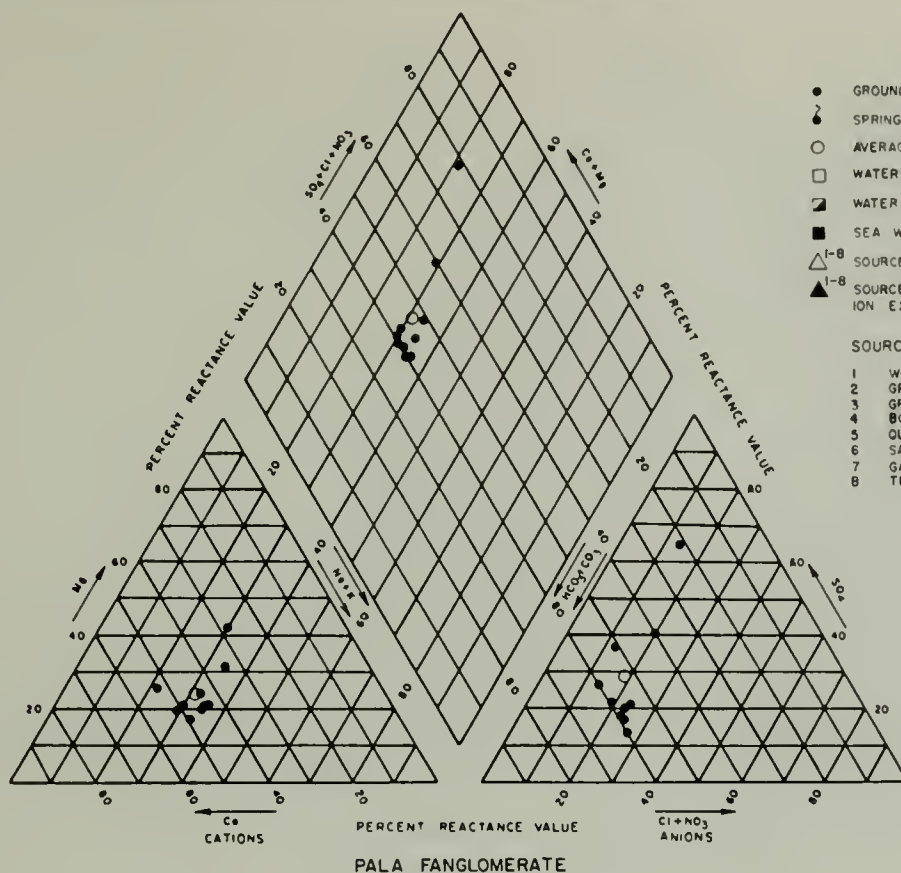
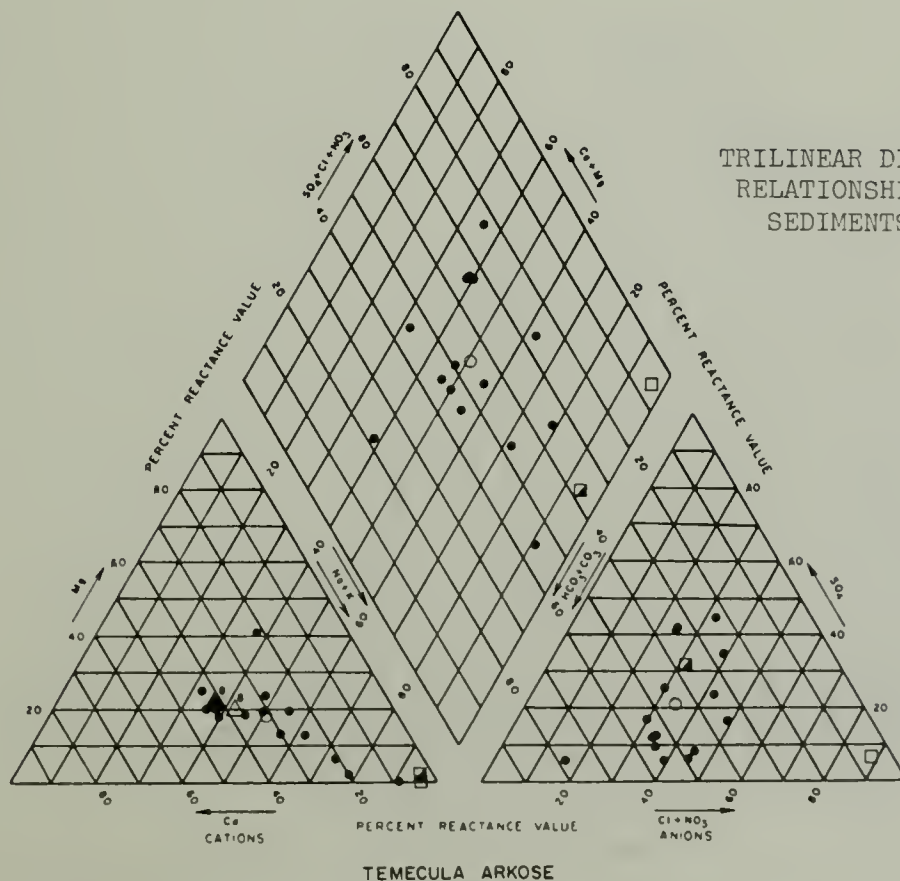
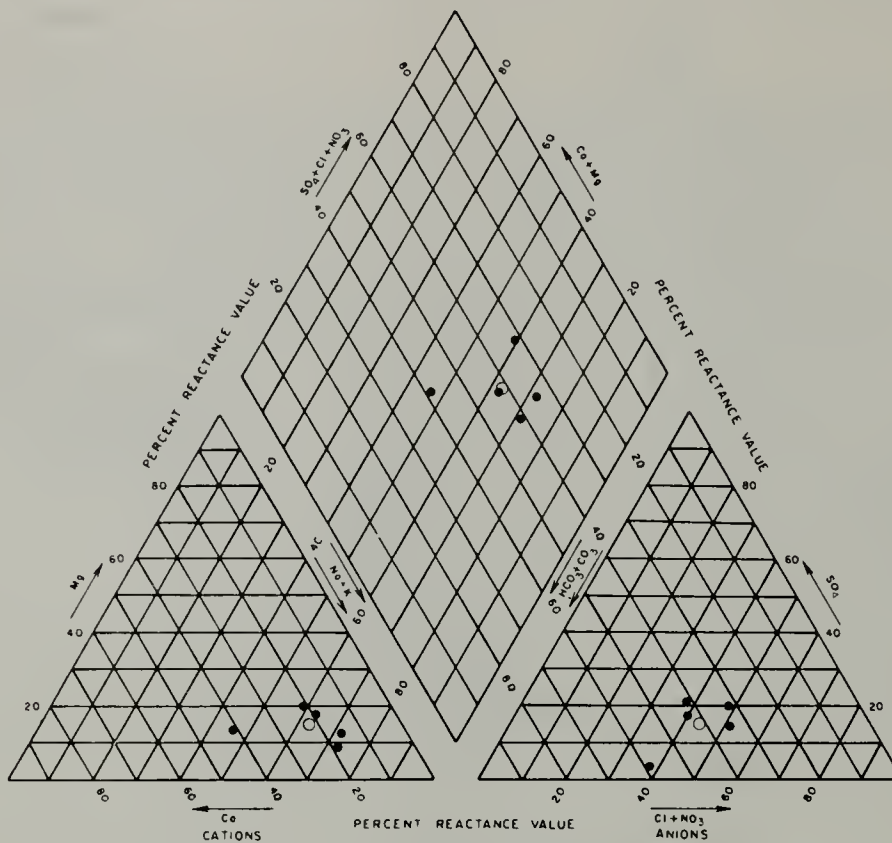


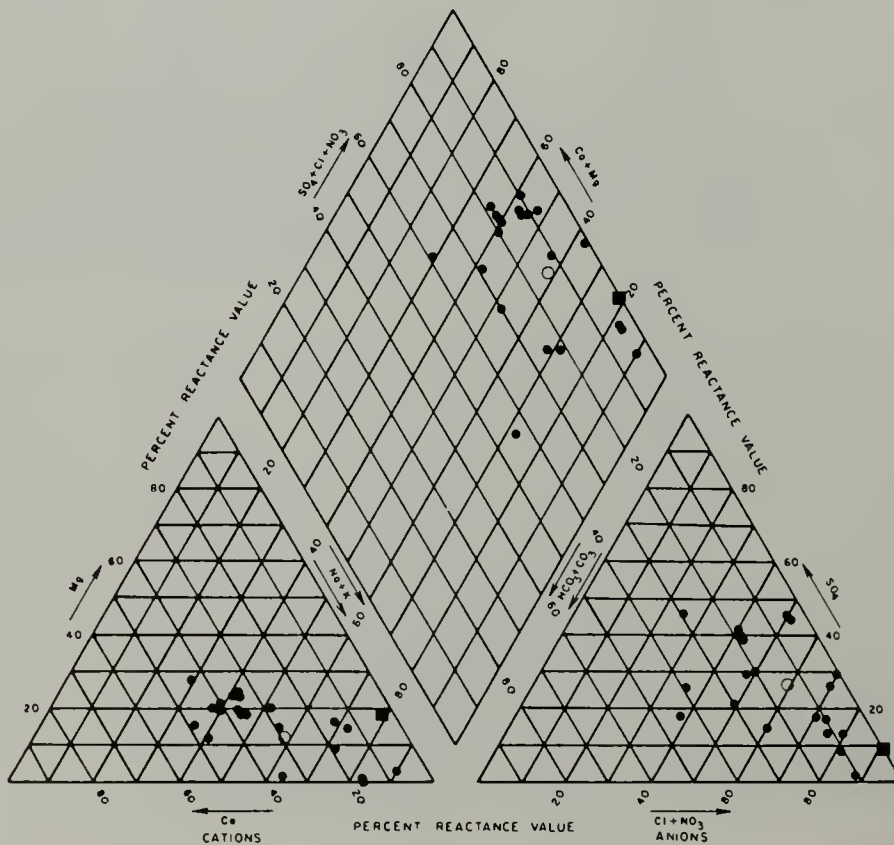
FIGURE 8A

TRILINEAR DIAGRAMS SHOWING CHEMICAL
RELATIONSHIP BETWEEN PLEISTOCENE
SEDIMENTS AND EXTRACTED WATER





POWAY CONGLOMERATE



LA JOLLA FORMATION

LEGEND

CHEMICAL ANALYSES OF

- GROUND WATER FROM SOURCE ROCK
- SPRING WATER FROM SOURCE ROCK
- AVERAGE DETERMINATION OF WATER FROM SOURCE ROCK
- WATER FROM MURRIETA HOT SPRINGS
- WATER FROM WARNER HOT SPRINGS
- SEA WATER
- △ 1-8 SOURCE ROCK-CATION DETERMINATION
- ▲ 1-8 SOURCE ROCK-CATION DETERMINATION, POTASSIUM ION EXCLUDED FROM CALCULATIONS

SOURCE ROCKS (AS PER SUPERSERIALS 1-8)

- 1 WOODSON MOUNTAIN GRANODIORITE
- 2 GRANODIORITE-WORLD AVERAGE
- 3 GREEN VALLEY TONALITE
- 4 BONSALL TONALITE
- 5 QUARTZ DIORITE (TONALITE)-WORLD AVERAGE
- 6 SAN MARCOS GABBRO
- 7 GABBRO-WORLD AVERAGE
- 8 TEMECULA ARKOSE

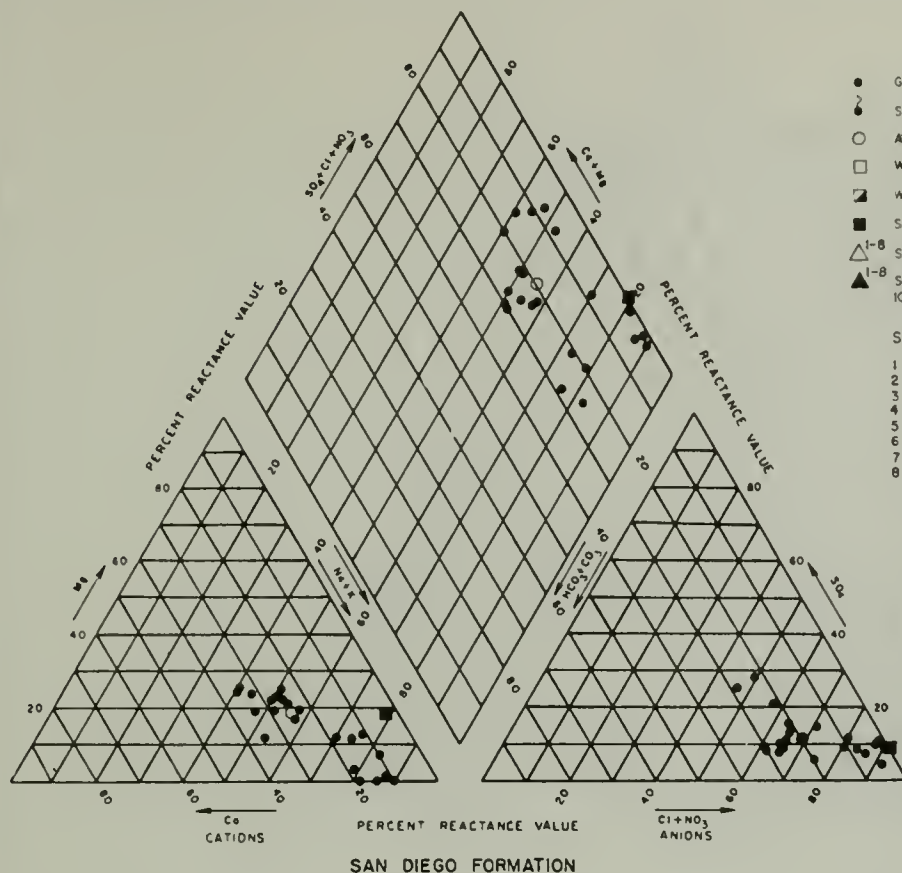
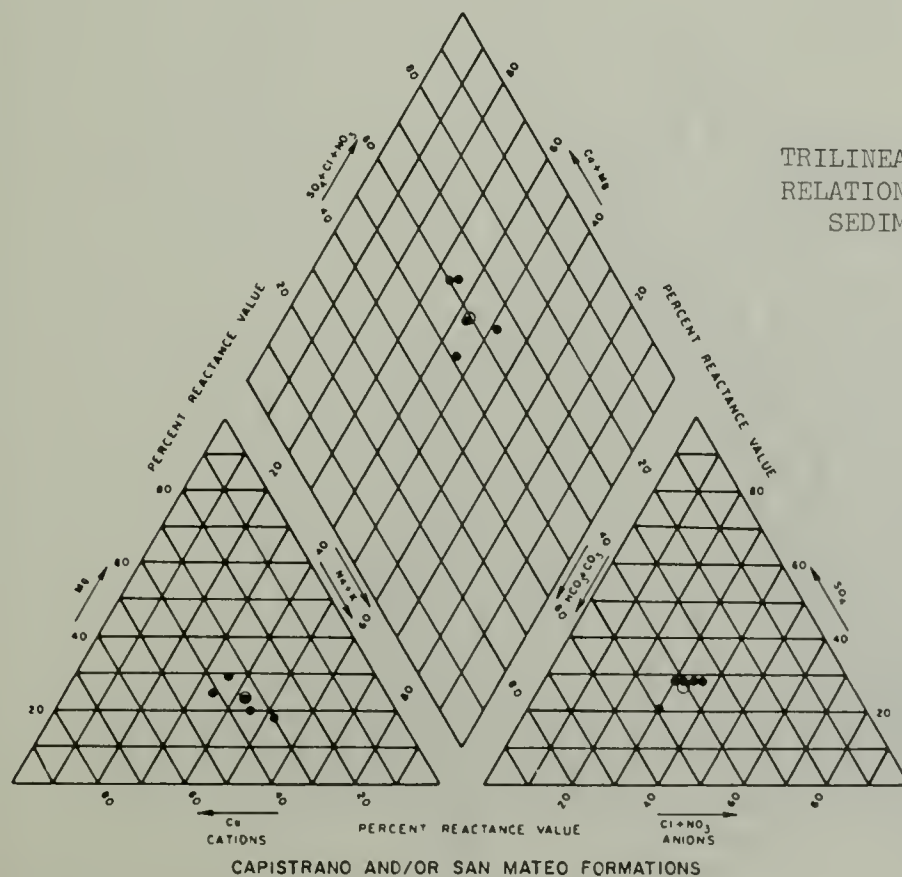
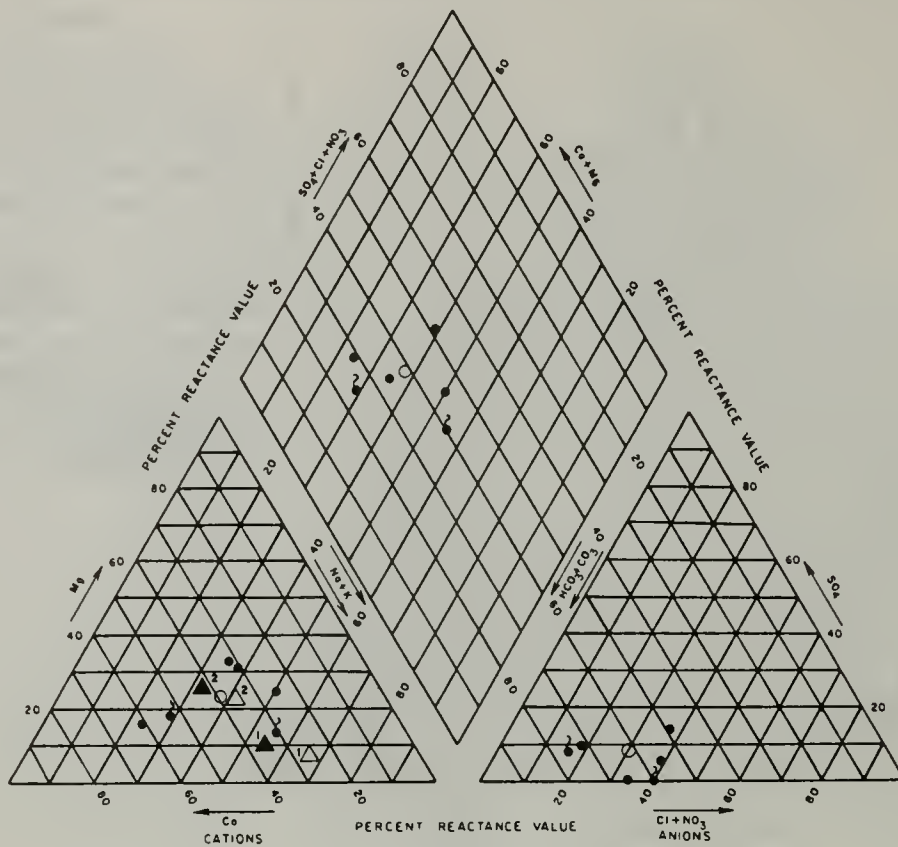


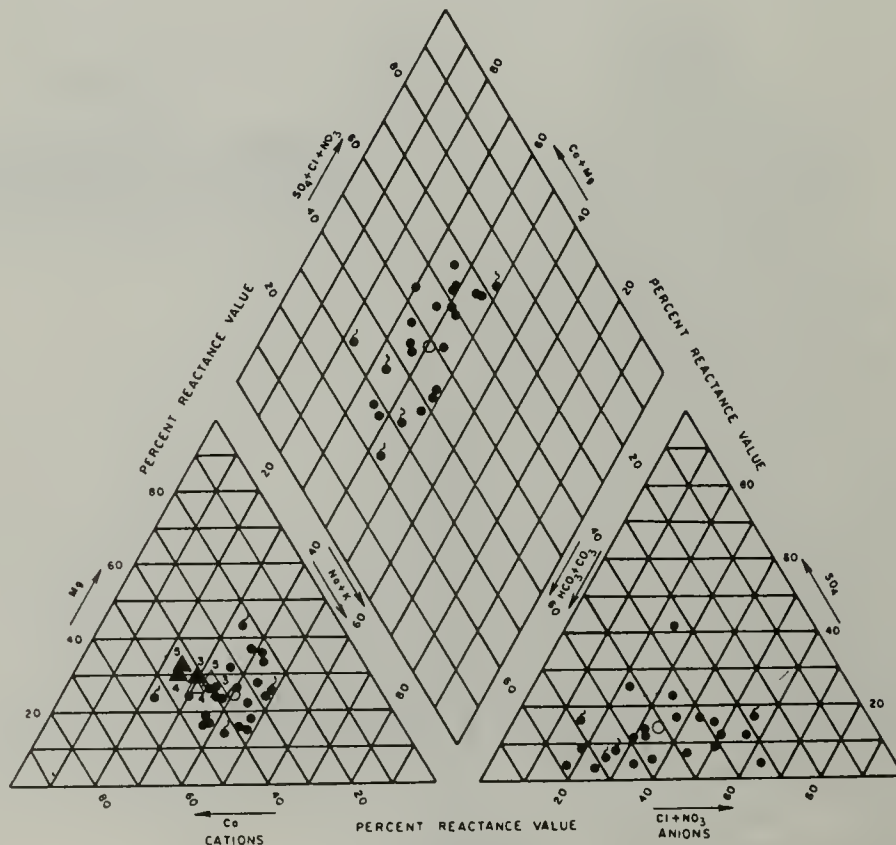
FIGURE 8B

TRILINEAR DIAGRAMS SHOWING CHEMICAL
RELATIONSHIP BETWEEN PRE-QUATERNARY
SEDIMENTS AND EXTRACTED WATER





GRANODIORITE



TONALITE

LEGEND

CHEMICAL ANALYSES OF

- GROUND WATER FROM SOURCE ROCK
- SPRING WATER FROM SOURCE ROCK
- AVERAGE DETERMINATION OF WATER FROM SOURCE ROCK
- WATER FROM MURRIETA HOT SPRINGS
- WATER FROM WARNER HOT SPRINGS
- SEA WATER
- △¹⁻⁸ SOURCE ROCK-CATION DETERMINATION
- ▲¹⁻⁸ SOURCE ROCK-CATION DETERMINATION, POTASSIUM ION EXCLUDED FROM CALCULATION

SOURCE ROCKS (AS PER SUPERSSCRIPTS 1-8)

- 1 WOODSON MOUNTAIN GRANODIORITE
- 2 GRANODIORITE-WORLD AVERAGE
- 3 GREEN VALLEY TONALITE
- 4 BONSALL TONALITE
- 5 QUARTZ DIORITE (TONALITE)-WORLD AVERAGE
- 6 SAN MARCOS GABBRO
- 7 GABBRO-WORLD AVERAGE
- 8 TEMECULA ARKOSE

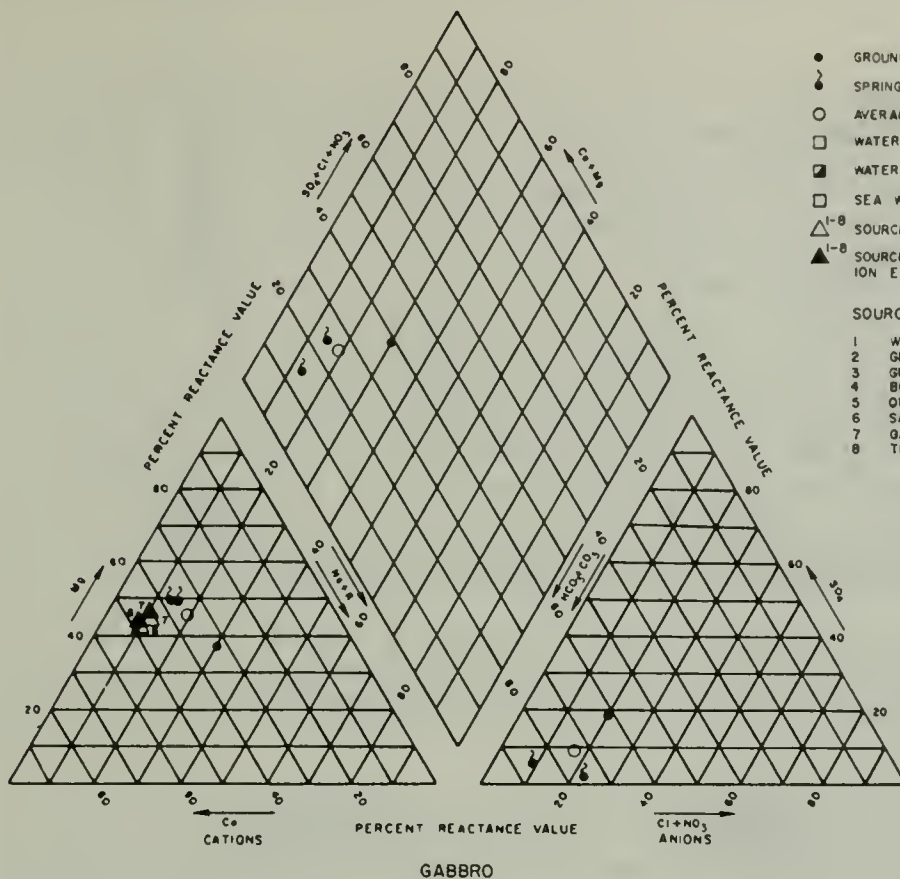
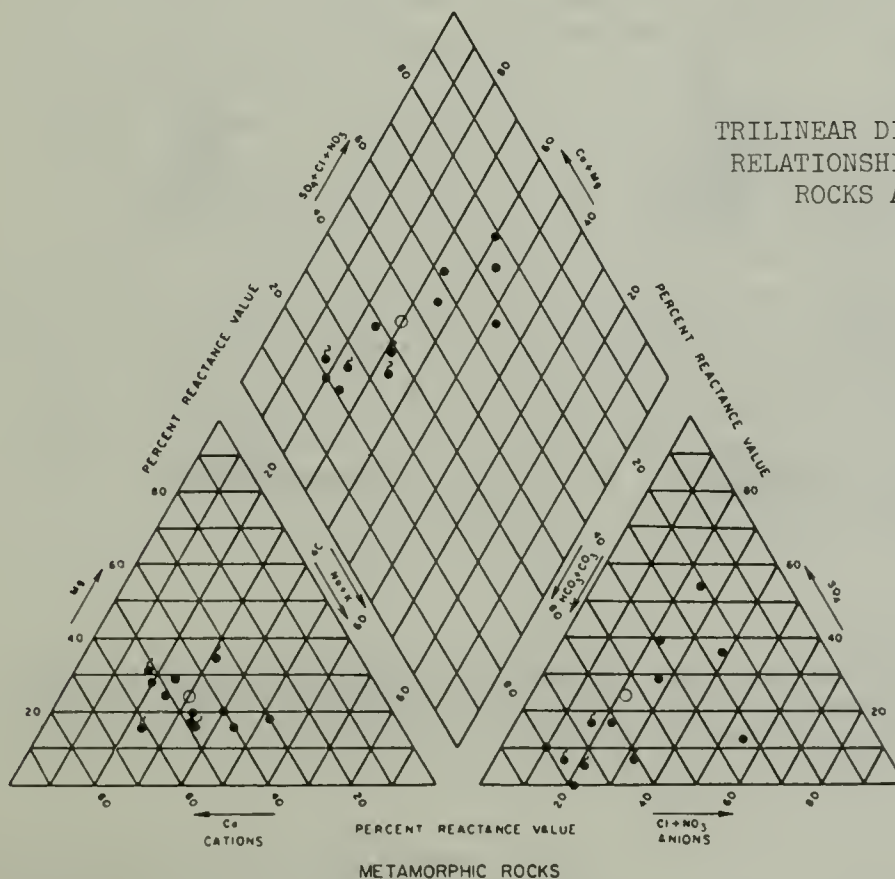


FIGURE 8C

TRILINEAR DIAGRAMS SHOWING CHEMICAL
RELATIONSHIP BETWEEN CRYSTALLINE
ROCKS AND EXTRACTED WATER



we might expect waters associated with these rocks also to be high in potassium. However, as has been previously explained, this is not the case. In fact, nearly all naturally occurring waters in the San Diego Region are so low in potassium that this ion is not significant in determining the chemical character of a water.

Employing this technique for estimating the cation chemical character of a water coming in contact with a given rock type, the following estimations were made: (1) magnesium-calcium for the San Marcos Gabbro, (2) sodium-calcium for the Green Valley Tonalite, (3) sodium-calcium for the Woodson Mountain Granodiorite, and (4) calcium-sodium for the Temecula Arkose. However, it should be noted that the sodium and calcium ion concentrations for (2), (3), and (4) above are, on the average, nearly equal with magnesium being higher in the tonalite.

The bicarbonate ion, which is largely derived from carbon dioxide in the atmosphere and from humus in the lithosphere, is generally the predominant anion in waters associated with these rocks.

A comparison of the distribution of TDS values for ground water from various rock types is shown on Figure 9. These graphs are based on nearly 400 chemical analyses of ground water, some of which have been influenced to some degree by man's activities, and therefore are not as selective as those used in preparing Figures 8A, 8B, and 8C.

Figure 9 indicates that, in general, ground water from the continental sediments (Pala Fanlomerate, Temecula Arkose, and Pauba Formation) has a TDS concentration which usually falls within the range of 200 to 600 ppm. In contrast, ground water from the San Diego, Capistrano, San Mateo, and La Jolla Formations and from the Poway Conglomerate generally has a TDS concentration falling within a range of 400 to 2,000 ppm. The higher TDS range for these sediments of marine origin is attributable to their connate waters which have been subsequently flushed out to varying degrees. Ground water extracted from the fractured, jointed, and weathered crystalline rocks (granodiorites, tonalites, gabbros, and the metamorphic rocks) has a TDS concentration that generally falls within a range of 150 to 700 ppm.

Evaluation of Effects

Using the techniques described in the preceding section to evaluate the effects of the major sedimentary and crystalline rocks on the chemical quality of ground water, the following findings were made:

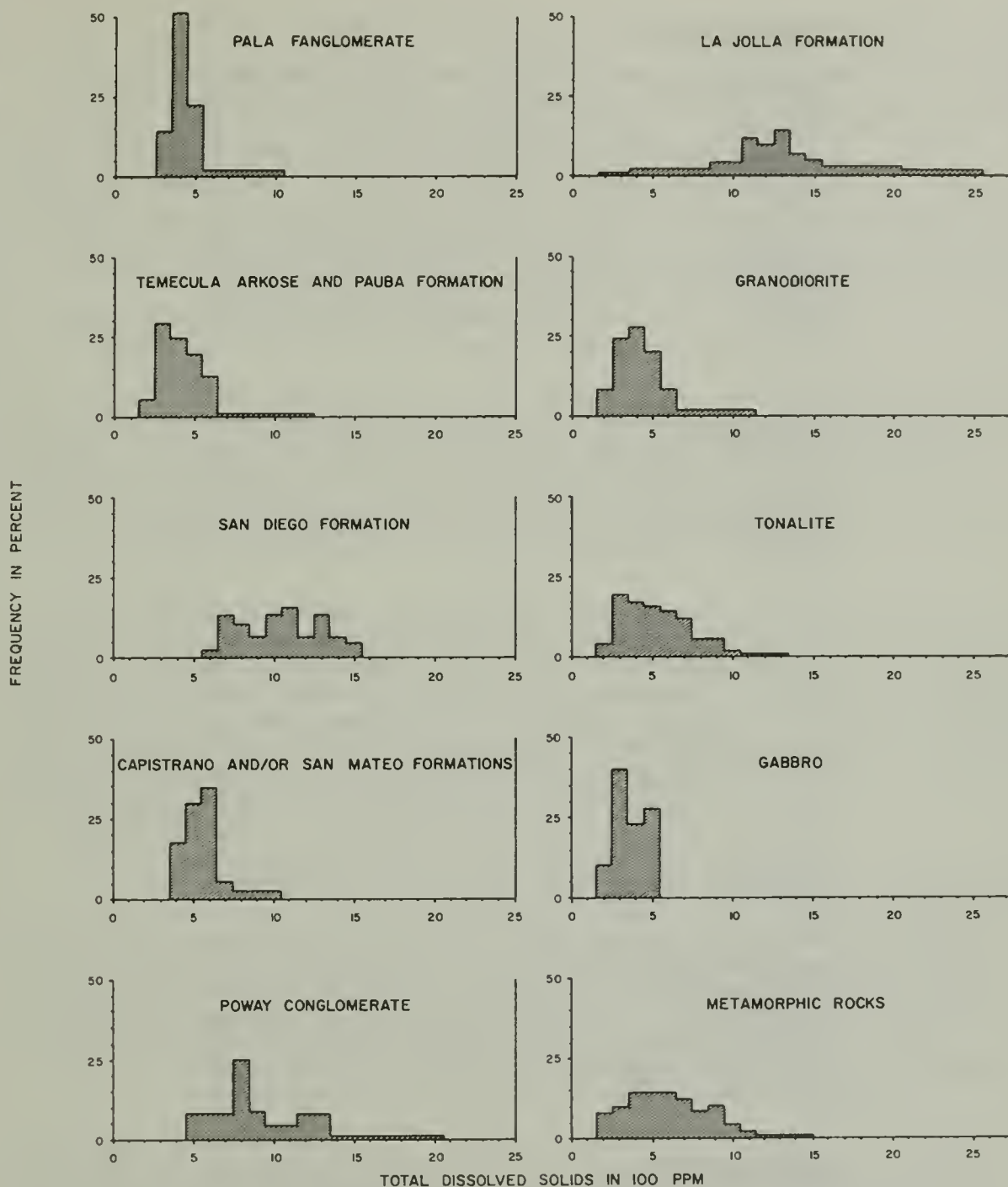


Figure 9
TOTAL DISSOLVED SOLIDS IN GROUND WATER FROM MAJOR ROCK TYPES

Sedimentary Rocks

Chemical analyses of the ground water from six sedimentary units are discussed in this section. Ground water from alluvium in the Region is excluded from this discussion because its chemical characteristics are variables which largely depend upon the watershed environment and local conditions resulting from man's activities. The six sedimentary rocks presented in this section to show the relationship of ground water to its host rock are as follows: Pleistocene Sediments -- Pala Fanglomerate and Temecula Arkose; pre-Quaternary Sediments -- San Diego Formation, Capistrano and San Mateo Formations, Poway Conglomerate, and La Jolla Formation.

Pala Fanglomerate. Ground water extracted from the Pala Fanglomerate in the Pala-Pauma Valley area is generally calcium-sodium bicarbonate in character and has a TDS content of 200 to 500 ppm. The average TDS of 10 selected chemical analyses shown on Figure 8A is 420 ppm. The range is plotted in Figure 9.

The trilinear plot of the average chemical analysis of the cations and anions of ground water from the Pala Fanglomerate exactly matches that of the average chemical analysis of ground water in the metamorphic rocks (Figure 8B). Also, the cation plot of ground water from the Pala Fanglomerate is nearly the same as that of the cation plot for the average chemical analysis of Bonsall Tonalite (Figure 8B). This substantiates the geologic evidence that the fanglomerate is slope wash derived primarily from the adjoining metamorphic rocks and Bonsall Tonalite along the Elsinore fault zone in the Agua Tibia Mountains.

Locally, the relatively high content of sulfate ion in ground water derived from the Pala Fanglomerate is probably a result of oxidation of sulfide minerals associated with the crystalline rocks of the surrounding terrain. However, a portion of the sulfate ion may possibly be a result of chemical fertilizers applied to the extensive agriculture areas.

Temecula Arkose. The Temecula Arkose occurs in the Temecula-Murrieta, Aguanga-Radec, and Warner Springs-Lake Henshaw areas. Analyses of ground water from 15 wells (also includes water from Pauba Formation) indicate that, although variable, the average chemical character is sodium bicarbonate (Figure 8A). This average is somewhat misleading because of the influence of Murrieta Hot Springs which is sodium chloride in character. A significant observation from the trilinear diagram is that the plot of cations from the rock analysis of the Temecula

Arkose is calcium-sodium (nearly equal percent reactance value) in character which also should be the character of ground water associated with the Temecula Arkose if the hot springs did not have an influence. Locally, the relatively high sulfate content is in part due to the effects of Warner Hot Springs which is sodium sulfate-chloride in character.

The total dissolved solids concentration generally ranges from 200 to 600 ppm with several analyses exceeding the upper value. The average TDS of 15 chemical analyses shown on the trilinear diagram (Figure 8A) is 500 ppm. The range of TDS is shown graphically in Figure 9.

San Diego Formation. The sediments of the San Diego Formation crop out extensively in the coastal plain section south of the San Diego River, with thick beds being found in Otay Mesa. Chemical analyses of ground water from 22 wells indicate the waters are sodium chloride in character (Figure 8B). The total dissolved solids content generally ranges from 600 ppm to 1,600 ppm and averages about 950 ppm (Figure 9).

The sodium chloride character of the ground water and its relatively high TDS is indicative of the marine origin of the San Diego Formation. Its connate water has only been partially flushed out by meteoric water. Chemical analyses of water from several wells located in the mesa south of the Otay River show an unusually high fluoride content (2 ppm to 5 ppm). The source of the fluoride ions may be the bentonitic tuff beds intercalated in the San Diego Formation.

Capistrano and San Mateo Formations. Cropping out in the area around San Mateo and San Juan Capistrano, these locally water-bearing sediments are limited in extent. Selected data from five wells indicate that the average chemical quality of this water is variable. The water is sodium-calcium bicarbonate-chloride in character (Figure 8B) with an average total dissolved solids content of about 500 ppm (Figure 9). The bicarbonate-chloride character of this water reflects partial flushing of the connate water from these formations.

Poway Conglomerate. A widely distributed sediment in the coastal plain north of San Diego, the Poway Conglomerate is locally water-bearing. Analyses of ground water from four wells indicate the chemical character generally to be sodium chloride-bicarbonate or bicarbonate-chloride (Figure 8B) with a total dissolved solids content generally ranging from 600 ppm to 1,200 ppm. A fifth well with a TDS of 400 ppm is sodium-calcium bicarbonate in character. Figure 9 indicates that the

TDS averages about 800 ppm. Ground water from the Poway Conglomerate (in part marine) appears to be partially flushed connate water as shown by the predominance of sodium and chloride ions associated with the bicarbonate ion and the variability of the total dissolved solids concentration.

La Jolla Formation. Occurring in the coastal plain section, the La Jolla Formation extends northerly from the San Diego River to the San Mateo Creek. Chemical analyses of ground water from 21 wells located in the mesa area between the San Dieguito and San Diego Rivers indicate an average chemical character of sodium chloride (Figure 8B). However, the chemical character of the water is variable, with calcium, bicarbonate, and sulfate ions also being locally prevalent. The total dissolved solids content averages about 1,400 ppm but generally falls within a range of 800 ppm to 2,200 ppm, with some exceptions as shown on Figure 9. As indicated by the average chemical character and variable high TDS, this water is a connate of marine origin which subsequently has been partially flushed by meteoric water. The locally occurring, relatively high sulfates probably indicate the influence of gypsiferous deposits in the La Jolla Formation.

Crystalline Rocks

Chemical analyses of ground water associated with igneous and metamorphic rocks are discussed in this section. Ground water derived solely from residuum is excluded from this presentation. The chemical characteristics of ground water from residuum, like that from alluvium, are variables which depend in large part upon the local environmental conditions resulting from man's activities. However, wells drilled into the crystalline rocks usually penetrate some residuum. The chemical quality of ground water collecting in the fractures and joints of the unweathered crystalline rocks is affected to some degree by overlying residuum which itself has been subjected to the influence of man's activities. The relationship of the chemical quality of ground water to its host rock (granodiorites, tonalites, gabbros, and metamorphic rocks) was evaluated as follows:

Granodiorite. Ground water extracted from the Woodson Mountain Granodiorite (five samples) is sodium to calcium or calcium to sodium bicarbonate in character, as shown by the trilinear diagram (Figure 8C). The average TDS of these samples is 240 ppm, but Figure 9 shows TDS values concentrated within a range of 150 ppm to 650 ppm. The higher values probably reflect the influence of man's activities on the ground water

which has percolated through the overlying residuum into fractures and joints in the granodiorites.

A plot of the average cations for this granodiorite is nearly coincident with a plot of the cations of the average world composition of granodiorite (Figure 8C). However, a plot of the average ground water associated with the Woodson Mountain Granodiorite is richer in calcium than a plot of the chemical analysis of Woodson Mountain Granodiorite itself. This may be because the calcium-rich feldspars weather more readily than the sodium-rich feldspars and, therefore, the ground water is richer proportionally in calcium ion than is the host rock.

Another possible explanation for the variation in chemical makeup is the mineral composition of the granodiorites. These rocks are somewhat heterogeneous due to the inclusions of dark-colored xenoliths which are calcium-rich in composition.

Tonalite. The chemical character of ground water extracted from the tonalites is variable, as shown in Figure 8C, with the anion group showing a greater spread than the cation group.

The average chemical character of ground water from 23 selected wells is sodium-calcium bicarbonate; however, the ions of magnesium and chloride are also fairly common in various combinations with the ions of sodium, calcium, and bicarbonate. The total dissolved solids content ranges from 150 ppm to 550 ppm, averaging about 360 ppm for the same 23 wells; however, a greater spread is shown on Figure 9. The wide variation in TDS and chemical character is due in part to the numerous inclusions within the tonalites.

As shown in Figure 8C, the average cation plot of ground water associated with tonalites is very similar to the average cation plot derived from chemical analysis of tonalites, but has a slightly higher sodium percent reactance value.

In addition, sodium as well as chloride ions in the ground water probably reflect the influences of man's activities and hot springs.

Gabbro. Ground water extracted from the gabbroic rocks, as shown by the plot of the chemical analyses of three selected samples (Figure 8C), is magnesium to magnesium-calcium bicarbonate in character.

The TDS of these samples falls within a range of 160 ppm to 260 ppm and averages 230 ppm. However, as shown on Figure 9,

the TDS varies from 150 to 550 ppm for a larger number of samples. The higher values probably reflect, to some degree, the influences of man's activities.

A plot of the cations, based on chemicals analyses of gabbro, indicates a calcium to calcium-magnesium rich rock.

Metamorphic Rocks. The chemical character of ground water extracted from the metamorphic rocks is variable, as shown on Figure 8C, with the anion group showing a greater spread than the cation group.

The average chemical character of ground water from 12 selected wells is calcium-sodium bicarbonate. The total dissolved solids content averaged 380 ppm and ranged from 200 to 700 ppm for these same wells; however, a greater spread is shown on Figure 9.

This large variation in TDS and chemical character may be attributed to the wide range in type and chemical composition of the metamorphic rocks and extensive shear zones associated with secondary mineralization. In addition, outside influences resulting from man's activities are a factor.

In conclusion, it appears that, except for the gabbroic rocks which are magnesium-rich, the cation plots of ground water (Figure 8C) are very similar for granodiorite, tonalite, and the metamorphic rocks. Ground water associated with these three rock types are calcium-sodium to sodium-calcium rich while ground water associated with the gabbroic rocks is magnesium to magnesium-calcium rich. The bicarbonate ion, largely derived from carbon dioxide in the atmosphere and humus in the lithosphere, is generally the predominant ion in waters associated with the crystalline rocks. However, the erratic occurrence of the anions in some of the waters may be largely attributed to the influence of hot springs, sulfide minerals, or man's activities.

EFFECTS OF MAN'S ACTIVITIES

Man's activities have had far-reaching effects on the chemical quality of the water resources of the San Diego Region. The use of supplemental waters by man to sustain his presence in the Region has modified the chemical quality of the native ground water.

The chemical quality of the native ground water has been modified by other activities of man. In fact, it has been impaired through such means as overpumping and poor waste disposal

practices. Impairment of the chemical quality of the ground water resources may also occur through the interchange between zones of waters of differing chemical quality by means of improperly constructed, modified, or destroyed wells.

Sources of Ground Water Impairment

Natural degradation of water quality from multiple sources and causes has existed for many years prior to man's development of the ground water resources of the San Diego Region. Under natural conditions, the rocks and soils forming the drainage area of a stream system determine the chemical characteristic of surface runoff and ground water stored in the valley fill. Locally, highly mineralized tributary springs and connate waters increase the quantity of chemical constituents in recipient streams and, consequently, that of the recharged ground water supply.

However, with the advent of man and consequent development of the area, especially in the coastal portion of the San Diego Region, impairment of the ground water supplies commenced. Water quality studies by the Department have brought into focus many of the sources of impairment of ground water quality. Major factors in the impairment of the chemical quality of ground water in the coastal alluvium-filled valleys have been declining water levels and overdraft conditions which have resulted in sea-water intrusion and/or the upward or lateral movement of connate water.

Other possible or potential sources of ground water impairment include injudicious discharge of effluent from developed hot springs; development of adverse salt balance conditions; indiscriminate disposal of industrial and domestic wastes; and application of chemical fertilizers.

Sea Water

Most of the water-bearing sediments along the coast of the Region are in direct contact with the floor of the ocean or an inland bay, that is, in hydraulic continuity. Where this exists, sea-water intrusion is a present or potential threat to the associated ground water reservoirs. Before these reservoirs were exploited, a seaward hydraulic gradient existed, and excess fresh water from inland areas escaped from springs near the beaches or from submarine springs off the coast. Before 1900, use of ground water supplies was relatively limited in California. However, rapid development in the use of ground water since then has created many serious problems, including overdraft and sea-water intrusion.

Since 1944, a continued ground water overdraft, due to increasing agricultural, municipal, and industrial demands, and to persisting drought, has lowered ground water elevations below sea level along the seaward margins of many alluvium-filled valleys. The accelerated development of these ground water reservoirs within the last 20 years has, in some instances, lowered the water table or piezometric surface to the extent that the natural seaward freshwater hydraulic gradient has been reversed. As a result of this ground water overdevelopment, the safe yield of the reservoirs has been exceeded and sea water has intruded. Thus, extensive damage and large economic losses have occurred.

Examples of sea-water intrusion are in the coastal portions of the San Dieguito and Tia Juana River Valleys (Plate 7). The ground water is sodium chloride in character with a TDS concentration greater than 2,000 ppm. (See Plates 9 and 10).

Connate Waters

Poor quality connate waters occur in some of the Tertiary marine sediments in the coastal portion of the Region. These waters may occur at depth in the sediments underlying the alluvial deposits and in the sediments occurring in the coastal mesa areas. In general, connate waters have been partially flushed out by meteoric waters, resulting in a decreased TDS concentration. For example, around the City of San Diego ground water extracted from the San Diego Formation is sodium chloride in character and generally has a TDS concentration of about 600 to 1,600 ppm.

North of the City of San Diego, similar connate waters occur in the La Jolla Formation, which produces ground water predominant in sodium chloride generally with 800 to 2,200 ppm total dissolved solids. Connate waters held in the interstices of marine sediments and sealed in by deposition of overlying beds may appear in water pumped from deep wells. Or it may appear in water pumped from wells where overdraft has caused freshwater levels to decline sufficiently to allow connate waters to migrate from the adjacent marine sediments.

In the coastal portion of the San Luis Rey River Valley, overdraft conditions (Plate 7) have induced the migration of connates from sediments of the La Jolla Formation.

Hot Springs

In highly faulted areas, hot springs exhibiting high mineralization may flow upon the ground surface. The hot springs in

some areas have been developed into mineral baths for health resorts. The chemical concentration of these waters generally exceeds the accepted domestic, irrigation, and industrial standards. If the effluent from the hot springs is discharged injudiciously to streams, it may impair the chemical quality of surface water in the area. The waters may also percolate directly into the alluvial sediments, causing direct impairment of the ground water.

Adverse Salt Balance

Use of water increases the total amount of dissolved solids by evaporation or by the addition of salts. The used water becomes waste water. If it returns to the water supply, the total dissolved solids concentration of the supply is increased. If the return continues indefinitely, the gradual increase caused by reuse and recirculation will eventually result in impairment of the water quality for major beneficial uses.

"Salt balance" is a term that signifies the amount of dissolved salts or constituents in a ground water reservoir in relation to time. If the salts entering the supply exceed those removed, the balance is called "adverse". If the opposite is true, the balance is "favorable". If salt outflow is equal to salt inflow, salt balance is "maintained". Note, however, that it is not related to the quantity of water available from the supply.

The hazards of pollution and contamination of a supply water resulting from reuse or return of waste water depend on the use to which the supply water is put. Impairment of quality of ground water is long lasting and may be permanent if there is no drainage from the ground water reservoir.

Degradation of water quality is further accentuated by adverse salt balance. Adverse salt balance is most pronounced in areas of overdraft where the water supplies are used extensively and in areas where there is little or no replenishment, that is, where little or no movement of ground water from or into the ground water reservoir takes place. In these areas, the salinity caused by even relatively innocuous wastes may build up dangerously over a period of years, thus rendering the ground water increasingly less suitable for beneficial uses. A favorable salt balance can often be maintained by exportation of ground water from the basin, although this could create overdraft conditions.

Multiple use and reuse of ground water increases the danger of adverse salt balance. Percolation of dissolved fertilizers and industrial wastes increases the mineral burden of the water and decreases the possibility of restoring a favorable

salt balance. Adverse salt balance in ground water is in marked contrast to adverse salt balance in surface waters in that the impairment of the quality of streams may be alleviated by flood flows or corrected by discontinuing the disposal of specific wastes.

Impairment of ground water quality due to development of adverse salt balance is extremely difficult to ascertain, and long-term records of chemical analyses of many wells are necessary to confirm adverse salt balance conditions. Examples of adverse salt balance conditions in the San Diego Region exist in the Escondido and El Cajon areas.

Industrial and Domestic Wastes

Discharges of industrial and domestic wastes affect the chemical quality and may constitute a source of pollution to the ground water of the San Diego Region. Examples of ground water impairment in the San Diego Region from indiscriminate waste disposal practices are as follows:

Boron. As a result of an investigation to determine possible boron pollution due to the waste disposal operations of two citrus processing and packing plants at Escondido, high boron concentrations were detected locally in both surface and ground water in 1951. The boron was traced to unusually high concentrations (415 - 766 ppm) in unlined waste disposal pits located adjacent to a minor tributary of Escondido Creek. Although the citrus plants have not used the sumps since 1959, the residual effect of the boron-rich percolating waters has persisted in the ground water in the Escondido area, being as much as 5 ppm in several wells. Waters containing concentrations of more than 2.0 ppm are classified injurious to unsatisfactory for irrigation.

Hexavalent Chromium. Discharge of rinse waters to the ground surface and to a cesspool from chrome plating operations resulted in pollution of a portion of the ground water in Murrieta. These discharges, which were halted in March 1956, caused four wells in the immediate vicinity of the waste disposal site to be polluted with hexavalent chromium in concentrations of up to 3 ppm. Eighteen other wells in Murrieta and vicinity contained traces of hexavalent chromium.

Chemical analyses of samples from wells in the immediate vicinity of the site on May 21, 1959, showed that three of the four wells had hexavalent chromium concentrations of 0.12 to 0.35 ppm, which exceeded the Public Health Service

Drinking Water Standards of 0.05 ppm. Although the residual effect of the chromium wastes was evident in 1959, it had decreased considerably from a maximum of 3.0 ppm in 1956.

Water Softener Regeneration Brines. Locally, the disposal of brine wastes from the regeneration of water softeners can constitute a source of excessive contributions of sodium and chloride ions to the ground water. The maximum increase of sodium and chloride in domestic sewage due to the regeneration of water softeners is about 280 and 430 ppm, respectively, for each house that has a private softener.

Nitrates. The discharge of domestic wastes through the use of cesspools, septic tanks, and leach lines has locally resulted in high nitrate concentrations throughout much of the San Diego Region. This is especially true where there is a deficiency in precipitation and little ground water movement to flush out the water-bearing materials. In some of the larger, relatively densely populated areas such as Fallbrook, Escondido, Lakeside, and El Cajon, the nitrate ion concentration of ground water from selected wells exceeds the Public Health Service Drinking Water Standards of 45 ppm (Plates 11A and 11B). Between 1951 and 1963, the nitrates varied from 45 to more than 300 ppm from individual wells in these communities. In addition to nitrates being derived from discharges of domestic wastes, the application of chemical fertilizers and the wastes from stock also probably account for nitrates being added to ground water.

Alkyl Benzene Sulfonate (ABS). Locally in the Region, concentrations of alkyl benzene sulfonate (formerly a constituent of most household detergents and commonly known as ABS) have caused foaming both in surface and ground water. However, with the changeover from ABS, a "hard type" detergent, to LAS (linear alkyl sulfonate) a "soft type" detergent which is biologically degradable, foaming has diminished.

As little as 0.5 ppm of ABS in a water supply will cause foaming when the water is drawn from the household tap, especially if the faucet has a screening device to cause agitation. Foam has been observed in such streams as Escondido Creek, San Diego River, and Sweetwater River.

Chemical Fertilizers

In intensively developed irrigated agricultural areas, various types of fertilizer compounds are added to the soil to increase

crop production. The application of chemical fertilizers to agricultural lands has at least locally affected the chemical quality of ground water in the San Diego Region. Chemical fertilizers that are now or were extensively used in the past are compounds high in ammonium, sulfate, nitrate, and phosphate. These compounds are primarily used to add nutrients to the root zone in an available form for crop utilization and to condition the soil. Truck crop areas generally utilize 2,000 to 3,000 pounds of fertilizer per acre, per year, whereas orchard areas generally utilize 200 to 300 pounds of fertilizer per acre, per year. The amount of soluble ions that will go into the ground water will depend upon: (1) the crop, (2) tillage practice, (3) type of fertilizer, (4) quantity and quality of applied water, (5) organisms in the soil, (6) climatic conditions, and (7) soil characteristics.

Excess nitrates and sulfates that have been leached from the root zone are carried down into the ground water through irrigation. However, it should be emphasized that nitrates in the ground water of the San Diego Region probably have been derived largely from domestic wastes.

Influences of Supplemental Waters

The influences of supplemental waters must be considered in evaluating the present and future chemical quality of ground water in the San Diego Region. These include present use of imported Colorado River water, potential use of imported Northern California water, greater use of reclaimed waste water, and planned use of desalinized water.

Colorado River Water

The quantity of Colorado River water imported into the San Diego Region since 1947-48 to meet the needs of the area has paralleled the increase in population and industrial growth.

The chemical character of this water is generally calcium-sodium sulfate to sodium-calcium sulfate with a total dissolved solids concentration of 650 to 850 ppm. Imported water is very different chemically from native water in most of the San Diego Region. The historical change in chemical character of water in storage in San Vicente and Sweetwater Reservoirs (Plate 10) clearly shows the influence of Colorado River water on the natural runoff. Not only has the chemical character of water stored in these lakes and reservoirs changed, but the total dissolved solids have also increased threefold. In addition, the importation of this water has locally modified the chemical character of ground water as well as surface water.

Northern California Water

Importation of Northern California water to the San Diego Region will commence in 1972. This water will be diverted from the delta of the San Joaquin-Sacramento Rivers and conveyed to Southern California through canals and pipelines of the State Water Project. Facilities will be constructed to ensure passage of higher quality Sacramento River water across the delta to the point of diversion.

The water quality objectives for water delivered to Southern California from the State Water Project are that, for any 10-year period, water will not exceed the concentrations for total dissolved solids of 220 ppm, total hardness of 110 ppm, chlorides of 55 ppm, sulfates of 20 ppm, and 40 percent sodium. The concentrations of chemical constituents dissolved in the imported water in general will be lower than that found in most ground water in the San Diego Region.

Importation of Northern California water should result in the amelioration of the chemical quality of the water resources of the San Diego Region. However, it should be noted that water is imported to the Region by the San Diego County Water Authority and the Orange County Municipal Water District (San Juan-Trabuco area). These agencies are now delivering Colorado River water obtained from the Metropolitan Water District. The mixture and therefore the quality of imported waters delivered to the Region by these agencies after completion of the State Water Project cannot be described at this time.

Reclaimed Waste Water

The chemical quality of ground water is also affected by discharge of waste water treatment plant effluent. Reclamation of waste water from treatment plants has recently been a subject of discussion in coastal San Diego County (DWR Bulletin No. 80-2). The effluent from waste water treatment plants has been utilized directly or indirectly for irrigation, ground water recharge, and recreation in the Region. The most significant factor affecting the chemical quality of a waste water is the quality of the original supply water. However, because of the addition of chemical constituents through domestic and industrial uses, the chemical content of a waste water is higher than that of the supply water. Conventional waste water treatment does not appreciably affect the chemical quality.

In the coastal portion of the San Diego Region, the major part of which lies within the San Diego County Water Authority

service area, about 80 percent of the water supply is Colorado River water. Therefore, the chemical quality of the supply water and the waste water is strongly influenced by the chemical quality of Colorado River water, with varying minor influences from other local sources.

The normal range of increase of chemical constituents by waters used for domestic purposes is presented in Table 9.

The influence of waste water effluents from treatment plants (Plates 10, 11, 12, and 13) clearly appears in surface flow or in ground water in portions of the San Diego River, Tia Juana River, Escondido Creek, San Luis Rey River, and San Dieguito River Valleys. It should be pointed out that most of the waste water treatment plant effluent in the San Diego Region is currently being discharged to the ocean through sewer outfalls. In recent years, however, an increasing number of reclamation projects have adopted planned waste water reclamation practices for recreation, irrigation, and ground water recharge. Among these projects are the well-known recreational lakes at Santee and ground water replenishment facilities at Whelan Lake near Oceanside.

Desalinized Water

As discussed in Chapter III, it is planned to use desalinized water in the south coastal portion of the San Diego Region as a supplemental source of supply, and to blend it with water from other sources.

TABLE 9

INCREASE IN CHEMICAL CONCENTRATIONS RESULTING FROM DOMESTIC USES*

Constituent	Parts per million	Constituent	Parts per million
TDS	100 - 300	SO ₄	15 - 30
Ca	15 - 40	Cl	20 - 50
Mg	15 - 40	N	20 - 40
Na	40 - 70	P	20 - 40
K	7 - 15	B	0.1 - 0.4

*From DWR Bulletin No. 80-2.

CHAPTER VI. WATER RESOURCES OF THE HYDROLOGIC UNITS

This chapter presents a description of the water resources for each of the 11 hydrologic units in the San Diego Region. In addition, a description of each of the 54 subunits (see Plate 1) is presented in Table 10. Physiographic boundaries are discussed in Chapter II.

This chapter should be reviewed in conjunction with the plates, figures, and appendixes that form the basis for this report on the San Diego Region.

SAN JUAN HYDROLOGIC UNIT (Z-01.00)

San Juan Hydrologic Unit (Unit 1) is a trapezoidal-shaped area of about 500 square miles (Plate 1). A significant portion of this unit is taken up by the Camp Pendleton Marine Base, which contains a large military population. Laguna Beach, San Juan Capistrano, Capistrano Beach, and San Clemente are other major population centers. Several smaller towns are scattered along the coast. The major land use is military, with urban-suburban development and irrigated agriculture as secondary uses. Recently, however, urbanization has been accelerated with the building of extensive new housing tracts.

Many streams drain this unit, the largest being San Juan, San Mateo, San Onofre, and Aliso Creeks. In general, annual precipitation is slightly higher in this unit than in most of the southern units of the Region, ranging from less than 12 inches near the coast to 30 inches close to the eastern boundary (Plate 5). Information on the subunits of the San Juan Hydrologic Unit is presented in Table 10.

Unit 1 occurs in both the coastal plain and mountain-valley physiographic sections. The coastal plain section is 12 to 15 miles in width. It is composed of Upper Cretaceous and Mio-Pliocene marine sediments which have been incised and backfilled with Recent alluvium (Plates 2A and 3A). The alluvium, up to 200 feet in thickness (Plate 4A), is the major water-bearing sediment. The Capistrano and San Mateo Formations are locally water bearing, but the other pre-Quaternary sediments in this unit are essentially nonwater bearing.

The northeastern portion of the unit (mountain-valley section) is composed principally of crystalline rocks (tonalites, granodiorites, and metamorphic rocks) along with associated areas of residuum. The residuum and fractured crystalline rocks are the chief water-bearing materials in this part of the unit. Residuum overlying the fractured rocks attains thicknesses in some areas of 100 feet.

TABLE 10
DESCRIPTION OF HYDROLOGIC SUBUNITS

AREAL CODE AND NAME OF SUBUNIT 1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY					
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) 5		
		Coastal Plain	Mountain- Valley								Domestic Use	Irrigation Use	
Z-01.00 San Juan Hydrologic Unit													
Z-01.A0 Laguna	Triangular, 64 sq. miles; largely in Alliso Creek watershed	Qal, Qp ₄ , Qp ₁ , Tk ₆ , Tk ₅		<13-19	Qal	100	<25-100	--	Na SO ₄ , Na HCO ₃	250- 5,000	Marginal-inferior (TDS, SO ₄ , F); locally suitable	Marginal-inferior (EC, Cl, locally B)	
Z-01.B0 San Juan	Triangular, 177 sq. miles; Arroyo Trabuco and San Juan Creek watersheds	Qal, Qp ₄ , Qp ₁ , Tk ₆ , Tk ₅ , Tk ₃ , Tk ₁	Qr, Kgr, Kto, Koi, M ₂	<13-30	Qal	200	<25-75	--	Ca-Na SO ₄ -HCO ₃ Ca HCO ₃	<250- 5,000	Suitable-inferior (SO ₄ , TDS)	Suitable; locally marginal-inferior (EC, Cl, % Na)	
Z-01.C0 San Clemente	Triangular, 21 sq. miles; vicinity of San Clemente	Qal, Qp ₁ , Tk ₆ , Tk ₅		<12-15	Tk ₆	960	>100	Mainly connate water	Na-Ca HCO ₃ -Cl, Na Cl	250- 750	Suitable; locally inferior (SO ₄)	Suitable-inferior (EC, Cl)	
Z-01.D0 Mateo	Rectangular, 135 sq. miles; San Mateo Creek watershed	Qal, Qp ₄ , Qp ₁ , Tk ₆ , Tk ₅ , Tk ₃ , Tk ₁	Qr, Tk, Kgr, Kgr ₁ , Kto ₁ , Koi, M ₂	<12-20	Qal	80	<25-50	--	Ca-Na HCO ₃ -Cl	250- 750	Suitable	Suitable	
Z-01.E0 San Onofre	Triangular, 103 sq. miles; San Onofre Creek watershed	Qal, Qp ₄ , Qp ₁ , Tk ₆ , Tk ₅ , Tk ₃ , Tk ₁	Qr, Kto ₃ , Kto ₁ , Koi, M ₂	<13-19	Qal	--	<25-50	--	Variable 3	250- 1,000	Suitable	Suitable; locally marginal (Cl, % Na, EC)	
					Tk ₆ , Tk ₅	--	--	Mainly connate water	--	500- 750	Suitable	Suitable	

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT 1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY						
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) 5			
		Coastal Plain	Mountain- Valley								Domestic Use	Irrigation Use		
Z-02.00 Santa Margarita Hydrologic Unit														
Z-02.A0 Ysidora	Rectangular, 43 sq. miles; extends north from Camp Del Mar to Fallbrook	Qa1, Qp4, Qp1, Tk5, Tk3	Qa1, Qr, Qp4, Kgr1, Kto3, Kb1, M2	<12-18	Qa1	200	<25	Sea water, connate water 3 from Tk3	Ne Cl, Na HCO3-Cl	500- >5,000	Suitable-inferior (TDS, SO4, NO3) (Cl, EC)	Suitable-inferior (Cl, EC)		
					Qr, fractured crystal- line rocks	350	--	--	Variable	500- 1,500	Inferior (NO3); locally suitable	Marginal-inferior (EC, Cl); locally suitable		
Z-02.B0 De Luz	Trapezoidal, 112 sq. miles; portions of Santa Margarita River and De Luz Creek water- sheds	Qa1, Qp4, Qr, Tk, Kgr1, Kto3, Kb1, M2	Qa1, Qp4, Qr, Tk, Kgr1, Kto3, Kb1, M2	16-20	Qa1, Qp4	--	--	--	Ca-Na HCO3, locally Na Cl	<250- 500	Suitable; locally inferior (F)	Suitable; locally inferior (\$ Na)		
					Qr, fractured crystal- line rocks	--	--	--	Variable	<250- 1,500	Suitable; inferior (SO4, NO3, TDS)	Suitable; locally marginal (EC, Cl)		
Z-02.C0 Murrieta	Horseshoe shaped, 133 sq. miles; portions of Murrieta and Warm Springs Creeks watersheds	Qa1, Qp2, Qp4, Qr, Tk, Kgr1, Kb1, M2	Qa1, Qp2, Qp4, Qr, Tk, Kgr1, Kb1, M2	13-20	Qa1, Qp2	1,350	<25->100	Deep seated water along faults 3	Na-Cs HCO3-Cl, Ca-Na HCO3, Na Cl-HCO3	<250- 500, locally >500	Suitable; locally marginal-inferior (TDS, SO4, NO3)	Suitable; locally marginal-inferior (\$ Na, EC, Cl)		
					Qr, fractured crystal- line rocks	100	<25-50	Deep seated water along faults 3	Variable	250- 1,000	Suitable	Suitable		
Z-02.D0 Ald	Parallelogram, 96 sq. miles; Tuculota Creek watershed	Qa1, Qp2, Qr, Kgr1, Kto, Kto3, Kb1, M3, M2	Qa1, Qp2, Qr, Kgr1, Kto, Kto3, Kb1, M3, M2	13-18	Qa1, Qp2	600	<25-75, locally >100	Deep seated water 3	Na-Ca HCO3	<250- 1,000	Suitable; locally marginal-inferior (F, SO4)	Suitable; locally marginal-inferior (\$ Na, Cl, B)		
					Qr, fractured crystal- line rocks	200	<25-50	--	Variable	750- 1,500	Suitable-inferior (TDS, SO4)	Suitable; locally marginal (B)		

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT 1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY				
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	Rating (factors exceeding limits for suitable rating) 5		
		Coastal Plain	Mountain- Valley							TDS ppm	Domestic Use Irrigation Use	
Z-02.E0 Pechanga	Triangular, 44 sq. miles; Temecula River and Pechanga Creek watersheds		Qal, Qp2, Kgr1, Kb1, M2	14-20	Qal, Qp2	2,500	Flowing to 75	Deep seated water 3	Na-Ca HCO3-Cl	<250- 1,000	Suitable; locally marginal-inferior (F, SO4)	Suitable-inferior (% Na)
Z-02.F0 Wilson	Rectangular, 60 sq. miles; Wilson Creek watershed		Qal, Qp2, Qr, Kto, M3	13-18	Qal, Qp2	400	<25-100	Deep seated water along faults 3	Na HCO3, Ca-Ma HCO3, Na Cl-SO4	250- 1,500	Suitable; locally marginal (TDS, F, SO4)	Suitable-marginal (% Na, Cl)
Z-02.G0 Anza	Rectangular- elliptical, 85 sq. miles; includes Anza and Cochuila Valleys		Qal, Qp4, Qp3, Qr, Kto, M3	13-19	Qal, Qp4, Qp3	400	<25-100	Deep seated water along faults 3	Na HCO3, Ca SO4	250- 1,500	Suitable-marginal (TDS, SO4)	Suitable
Z-02.H0 Aguanga	Mushroom shaped, 102 sq. miles; includes Rader and Aguanga Valleys		Qal, Qp2, Qr, Kbr, Kto, M3, M2, M1	13-25	Qal, Qp2	2,500	Flowing to 100	Deep seated water along faults 3	Variable	250- 1,500	Suitable-inferior (TDS, SO4, F)	Suitable; locally marginal-inferior (% Na)
					Qr, fractured crystal- line rocks	400	--	--	--	--	--	--
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DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT 1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY					
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) 5		
		Coastal Plain	Mountain- Valley								Domestic Use	Irrigation Use	
Z-02.10 Oakgrove	Rectangular, 75 sq. miles; includes Aguanga Mountain area		Qal, Qp ₃ , Qp ₂ , Qr, Kgr, Kto, M ₃ , M ₂	13-20	Qal, Qp ₂	200	<25-75	Deep seated water along faults 3	Ca-Mg HCO ₃ , Mg HCO ₃	250- 500	Suitable; locally marginal (SO ₄)	Suitable; locally inferior (% Na)	
					Qr, fractured crystal- line rocks	300	75->100	--	Mg HCO ₃ , Ca HCO ₃	250- 500	Suitable	Suitable	
Z-03.0C San Luis Rey Hydrologic Unit													
Z-03.40 Bonsall	Triangular, 186 sq. miles; includes Oceanside, Valley Center, and portions of Fallbrook	Qal, Qp ₄ , Qp ₁ , Tk ₅ , Tk ₃	Qal, Tk, Qr, Kgr, Kgr ₁ , Kto ₃ , Koi, M ₂	<12-20	Qal	210	<25->100	Sea water, connate water 3 from Tk ₃	Na-Ca Cl, Ca-Mg SO ₄ -Cl	500- >5,000	Marginal-inferior (TDS, SO ₄ , NO ₃); locally suitable	Suitable-inferior (Cl, EC, % Na)	
					Qr, fractured crystal- line rocks	130	<25-50	--	Na-Ca HCO ₃	250- 1,500	Suitable; locally marginal-inferior (SO ₄ , NO ₃)	Suitable; locally marginal (EC, Cl)	
Z-03.10 Monserate	Rectangular, 171 sq. miles; portions of San Luis Rey River watershed		Qal, Qp ₃ , Qr, Kgr, Kgr ₁ , Kto ₃ , Koi, M ₃ , M ₁	17-45	Qal, Qp ₃	400	<25->100	Deep seated water along faults 3	Ca-Mg HCO ₃ , Ca SO ₄ and variations	250- 500, locally 500- 1,000	Suitable; locally marginal-inferior (SO ₄)	Suitable	
					Qr, fractured crystal- line rocks	230	--	Deep seated water along faults 3	Variable	250- 500	Suitable; locally marginal-inferior (F, SO ₄)	Suitable; locally marginal-inferior (% Na, B)	

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT 1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY				
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) 5	
		Coastal Plain	Mountain- Valley								Domestic Use	Irrigation Use
Z-03.C0 Warner	Rhomboidal, 208 sq. miles; Lake Henshaw vicinity		Qal, Qp2, Qr, Kto3, Kto2, Koi, M3	20-40	Qal, Qp2	900	<25->100	Deep seated water along faults 3	Na-Ca HCO3, Ca-Na HCO3	<250- 500	Suitable; locally marginal-inferior (P)	Suitable-inferior (\$ Na)
			Qr, fractured crystal- line rocks			200	--	--	--	--	--	--
Z-04.C0 Carlsbad Hydrologic Unit												
Z-04.A0 Loma Alta	Needle shaped, 10 sq. miles; extends 8 miles inland from Oceanside	Qal, Qp1, Tk3		<12-13	Qal	--	<25-50	Connate water 3 from Tk3	Na Cl	1,000- 5,000	Suitable-inferior (TDS, SO4)	Inferior (Cl)
			Tk3			--	>100	Mainly connate water	Na Cl 3	1,000- 1,500 3	Marginal 3 (TDS)	Inferior (Cl)
Z-04.B0 Vista	Club shaped, 23 sq. miles; Carlsbad-Vista area	Qal, Qp1, Tk3, Kto1, M2	Qal, Qr, Tk3, Kto1, Koi, M2	<12-14	Qal	100	<25	--	Na Cl, Mg-Na Cl	750- 1,500	Marginal (TDS); inferior (NO3) (Cl)	Marginal-inferior (Cl)
			Qr, fractured crystal- line rocks			300	--	--	Na Cl	750- 1,500	Marginal (TDS)	Marginal (Cl)
Z-04.C0 Agua Hedionda	Elongate, 30 sq. miles; includes Agua Hedionda Creek watershed	Qal, Qp1, Tk3	Qal, Qr, Tk3, KGr1, Kto1, Koi, M2	<12-15	Qal	100	<25	--	Na Cl, Na-Ca Cl	500- 2,000	Marginal-inferior (TDS); locally suitable	Inferior (Cl)
			Tk3			280	--	Mainly connate water	Na-Ca Cl, locally Na-Ca SO4		Suitable; locally marginal-inferior (SO4, TDS)	Inferior (Cl)
			Qr, fractured crystal- line rocks			--	--	--	--	--	--	--

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT 1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY				
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) 5	
		Coastal Plain	Mountain- Valley								Domestic Use	Irrigation Use
Z-04.D0 Encinas	Triangular, 4 sq. miles; extends 4 miles inland from ocean between Hedionda and Batiquitos Lagoons	Qal, Qp ₁ , Tk ₃ , Tk ₁		<12-13	qal	260	<25-75	Mainly connate water	Na Cl	500- 1,500	Marginal-inferior (TDS, SO ₄)	Inferior (Cl)
Z-04.E0 San Marcos	Rectangular, 55 sq. miles; extends from Batiquitos Lagoon to San Marcos	Qal, Qp ₁ , Tk ₃	Qal, Qr, Kgr, Kgr ₁ , Kto ₁ , Kbi, M ₂	<12-17	Qal	<100	<25	--	Na Cl, Na HCO ₃ , Na SO ₄	500- 5,000	Suitable-inferior (NO ₃ , TDS, SO ₄)	Marginal-inferior (EC, Cl)
					Tk ₃	1,400	--	Mainly connate water	Na Cl	750- 1,500	Marginal (TDS, locally SO ₄)	Marginal-inferior (EC, Cl)
					Qr, fractured crystal- line rocks	--	60	--	Mg-Ca Cl, Mg-Na Cl	500- >1,000	Suitable-inferior (TDS, SO ₄)	Marginal; locally inferior (EC, Cl)
Z-04.F0 Escondido	Triangular, 89 sq. miles; Escondido Creek watershed	Qal, Qp ₁ , Qp ₁ , Tk ₃	Qal, Qp ₁ , Qr, Kgr, Kgr ₁ , Kto ₁ , Kbi, M ₂	<11-20	Qal	100	<25-50	Connate water ₃	Na Cl, locally Na Cl-SO ₄	500- 5,000	Marginal-inferior (TDS, SO ₄)	Inferior (EC, Cl, & Ne)
					Tk ₃	1,000 ³	25-50 ³	Connate water ₃	Na Cl ³	1,000- 5,000 ³	Marginal ³ (TDS, SO ₄ , NO ₃)	Inferior ³ (EC, Cl)
					Qr, fractured crystal- line rocks	450	<25-75	--	Na Cl-HCO ₃ , Mg Cl	250- >5,000	Suitable-inferior (TDS, NO ₃ , SO ₄)	Marginal-inferior (Cl, EC); locally suitable

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT ¹	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY				
		Rock Type ²		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water ⁴	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) ⁵	
		By Physiographic Coastal Plain	Mountain- Valley								Domestic Use	Irrigation Use
Z-05.00 San Dieguito Hydrologic Unit												
Z-05.A0 San Dieguito	Rectangular, 45 sq. miles; from coast to Lake Hodges	Qal, Qp ₄ , Qp ₁ , Tk ₃	Tk ₄ , Kb ₁ , M ₂	<11-15	Qal	150	<25-100	Sea water, connate water ³	Na Cl, Na-Ca Cl	500- >5,000	Marginal-inferior (TDS, SO ₄); locally suitable	Inferior; locally marginal (EC, Cl)
					Tk ₃	850	>100	Mainly connate water	Na Cl, Na Ca-Cl	500- >5,000	Marginal-inferior (TDS, SO ₄ , F); locally suitable	Inferior (EC, Cl); locally suitable
					Fractured crystal- line rocks	--	--	--	Na Cl, Na-Ca SO ₄ ³	1,000- 5,000 ³	Marginal-inferior ³ (TDS, SO ₄ , F)	Inferior ³ (EC, Cl)

Z-05.B0 Hodges	Rectangular, 50 sq. miles; Lake Hodges and portions of Escondido	Qal, Qr, Tk ₄ , Kgr, Kto ₁ , Kb ₁ , M ₂	Qal, Qr, Tk ₄ , Kgr ₁ , Kto ₁ , Kb ₁ , M ₂	15-18	Qal	65	25-75	--	Na-Ca Cl-HCO ₃	500- 1,000	Suitable	Marginal (Cl)
					Qr, fractured crystal- line rocks	450	<25->100	--	Variable	250- 1,000	Inferior (NO ₃); locally suitable	Suitable; locally marginal (EC, Cl)

Z-05.C0 San Pasqual	Trapezoidal, 66 sq. miles; includes San Pasqual Valley	Qal, Qp ₄ , Qr, Kgr, Kgr ₁ , Kto ₃ , Kto ₁ , Kb ₁ , M ₃ , M ₁	Qal, Qp ₄ , Qr, Kgr, Kgr ₁ , Kto ₃ , Kto ₁ , Kb ₁ , M ₃ , M ₁	15-25	Qal	210	<25-75	--	Na-Ca Cl-HCO ₃ , and variations	250- 1,000 locally 1,000- 1,500	Suitable; locally marginal-inferior (NO ₃ , F, TDS)	Suitable; locally marginal-inferior (Cl)
					Qr, fractured crystal- line rocks	100	--	--	--	250- 500 ³	--	--

Z-05.D0 Santa Maria	Somewhat rectangular, 57 sq. miles; Santa Maria Creek watershed	Qal, Qp ₄ , Qr, Kgr, Kgr ₁ , Kto ₂ , Kto ₁ , Kb ₁ , M ₁	Qal, Qp ₄ , Qr, Kgr, Kgr ₁ , Kto ₂ , Kto ₁ , Kb ₁ , M ₁	17-25	Qr, fractured crystal- line rocks locally Qal, Qp ₄	950	<25-75	--	Na Cl, Na HCO ₃ , Na-Mg HCO ₃	<250- 1,000	Suitable; locally marginal-inferior (NO ₃ , TDS)	Suitable; locally marginal (EC, Cl)

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT 1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY				
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) 5	
		Coastal Plain	Mountain- Valley								Domestic Use	Irrigation Use
Z-05.E0 Santa Ysabel	Triangular, 129 sq. miles; Santa Ysabel Creek watershed including Sutherland Reservoir		Qal, Qp ₃ , Qr, Kto ₃ , Kto ₂ , Kto ₁ , Kb ₁ , M ₃ M ₁	15-30	Qal	50	<25	--	Ca HCO ₃	250- 500	Suitable; locally inferior (NO ₃)	Suitable
					Qr, fractured crystal- line rocks	150	--	--	Na HCO ₃	<250- 500	Suitable	Suitable
Z-06.00 Penasquitos Hydrologic Unit												
Z-06.A0 Soledad	Rectangular, 55 sq. miles	Qal, Qp ₁ , Tk ₄ , Tk ₃	Kto ₁ , Kb ₁ , M ₂	<8-14	Qal	--	<25-50	Connate water ³ from Tk ₃	Na Cl, Na-Ca Cl	500- >5,000	Suitable-inferior (TDS, SO ₄)	Marginal-inferior (EC, Cl)
					Tk ₃ locally Tk ₄	700	75->100	Mainly connate water	Na with varia- tions of SO ₄ , Cl, HCO ₃	250- 5,000	Suitable-marginal (TDS, SO ₄)	Suitable-inferior (EC, Cl)
Z-06.B0 Poway	Somewhat elliptical, 41 sq. miles; Poway Valley	Qal, Qp ₄ , Qr, Tk ₄	Qal, Qp ₄ , Qr, Tk ₄ , Kto ₁ , M ₃ , M ₂	14-18	Qal, Qp ₄	60	<25	--	Na Cl, some Ca Cl	500- 1,500	Suitable-marginal (TDS, SO ₄)	Suitable-inferior (Cl)
					Qr, fractured crystal- line rocks	--	--	--	--	--	--	--
Z-06.C0 Scripps	Long, narrow area, 24 sq. miles; La Jolla coastal area	Qal, Qp ₁ , Tk ₄ , Tk ₃ , Tk ₁		<8-11	--	--	--	--	--	--	--	--
Z-06.D0 Miramar	"L" shaped, 41 sq. miles; includes Camp Mathew and Miramar Naval Air Station	Qal, Qp ₁ , Tk ₄ , Tk ₃		8-14	Qal	50	--	Connate water ³	Na-Ca Cl-SO ₄ ³	500- 1,500 ³	Inferior-marginal ³ (SO ₄ , TDS)	Inferior ³ (EC, Cl)
					Tk ₃ , Tk ₄	350	>100	Mainly connate water	Na Cl-HCO ₃	500- 1,500	Marginal-inferior (TDS, SO ₄ , F)	Marginal-inferior (EC, Cl, F Na)

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT ¹	AREAL DESCRIPTION	GEOHYDROLOGY					GROUND WATER QUALITY					
		Rock Type ²		Annual Precipitation inches	Water Bearing Materials	Maximum Orilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water ⁴	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) ⁵	
		By Physiographic Section	Mountain- Valley								Domestic Use	Irrigation Use
Z-06.E0 Tecolote	Rectangular, 9 sq. miles	Qal, Qp ₁ , Tk ₃		11-12	Tk ₄ , Tk ₃ , locally Qal	>100 ³	>100	Mainly connate water	Na Cl ³	500- 1,500	Marginal (TDS); locally suitable (% Na, Cl)	
Z-07.00 San Diego Hydrologic Unit												
Z-07.A0 Lower San Diego	Some-what rhomboidal, 170 sq. miles; includes El Cajon, Lakeside, and portions of Camp Elliot	Qal, Qp ₄ , Qp ₁ , Qr, Tk ₄ , Kgr, Kto, M ₂	Qal, Qp ₄ , Qr, Tk ₄ , Kgr ₁ , Kto ₃ , Kto ₁ , Kb ₁ , M ₃ , M ₂	<11-18	Qal, Qp ₄	200	<25-75	Connate water, deep seated water ³	Na-Ca Cl	250- >5,000	Marginal-inferior (SO ₄ , TDS, NO ₃) Suitable-inferior (EC, Cl, Na)	
			Tk ₄	--		<300	--	Mainly connate water	Na Cl	>1,000- 1,500	Marginal-inferior (TDS, SO ₄) Inferior (Cl, % Na)	
			Qr, fractured crystal- line rocks	<25->100		500		Deep seated water, connate water ³	Na-Ca Cl	<250- >5,000	Suitable-inferior (NO ₃ , TDS) Marginal-inferior (Cl); locally suitable	
Z-07.B0 San Vicente	Rectangular- triangular 75 sq. miles; San Vicente Reservoir area	Qal, Qp ₄ , Qr, Tk ₄ , Kgr ₁ , Kto ₃ , Kto ₁ , Kb ₁ , M ₃ , M ₂	Qal, Qp ₄	16-20	Qal, Qp ₄	>100 ³	<25-50	--	Variable	250- 500	Suitable Suitable	
			Qr, fractured crystal- line rocks	50-100		>100 ³		--	Variable	250- 500	Suitable; locally inferior (NO ₃) Suitable	
Z-07.C0 El Capitan	Rectangular, 88 sq. miles; includes Alpine, and El Capitan Reservoir	Qal, Qr, Kgr, Kgr ₁ , Kto ₃ , Kto ₁ , Kb ₁ , M ₃ , M ₁	Qr, fractured crystal- line rocks	16-35	Qr, fractured crystal- line rocks	200	<25->100	--	Variable	500- 1,000	Suitable Suitable; locally marginal (Cl)	

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT 1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY			
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	Rating (factors exceeding limits for suitable rating) 3	
		Coastal Plain	Mountain- Valley							TDS ppm	Domestic Use
Z-07.D0 Cuyamaca	Almost circular, 105 sq. miles; includes Cuyamaca Reservoir and Julian		Qal, Qr, Kgr, Kto, Kbi, M3, M1	18-35	Qr, fractured crystal- line rocks, Qal	350	50->100	--	Ca-Mg HCO3	<250- 750	Suitable; locally inferior (NO3) Suitable
Z-08.00 Coronado Hydrologic Unit											
Z-08.A0 Point Loma	Triangular, 6 sq. miles; Point Loma Peninsula	Qal, Qp1, Tk1		<11	--	--	--	--	--	--	--
Z-08.B0 San Diego Mesa	Rectangular, 42 sq. miles; City of San Diego and San Diego Bay area	Qal, Qp1, Tk7, Tk4	M2	<11-13	Tk4, Tk7	350	>100	Mainly connate water	Na HCO3, locally Na Cl	250- 750	Suitable Suitable
Z-08.C0 Paradise	Triangular, 11 sq. miles; National City area	Qal, Qp1, Tk7, Tk4		<11	Tk4, Tk7	800	>100	Mainly connate water	Na Cl, Na HCO3	500- 750	Suitable Suitable-marginal (Cl)
Z-09.00 Sweetwater Hydrologic Unit											
Z-09.A0 Lower Sweetwater	Mushroom shaped, 49 sq. miles; coastal Sweetwater River watershed	Qal, Qp4, Qp1, Tk7, Tk	Qp1, Qr, Tk7, Tk, Kto1, M2	<11-14	Qal	70	<25	Connate water3	Na-Ca Cl	2,000- 5,000	Inferior (TDS) Inferior (EC, Cl)
Z-09.B0 Middle Sweetwater	Triangular, 85 sq. miles; includes Sweetwater Reservoir	Qal, Qp4, Qr, Tk7, Tk, Kgr1, Kgr, Kto3, Kto1, Kbi, M3, M2	Qal, Qp4, Qr, Tk7, Tk, Kgr1, Kgr, Kto3, Kto1, Kbi, M3, M2	12-19	Qal	50	<25-50	--	Na-Ca Cl-HCO3, Na HCO3, variable	250- 1,000	Suitable Suitable; locally marginal (Cl)
					Qr, fractured crystal- line rocks	100	100	--	Variable	250- 1,500	Suitable; locally marginal-inferior (NO3, TDS) Marginal-inferior (Cl, B); locally suitable

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT-1	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY					
		Rock Type 2 By Physiographic Section		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water 4	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) 5		
		Coastal Plain	Mountain- Valley								Domestic Use	Irrigation Use	
Z-09.CO Upper Sweetwater	Elongate, 100 sq. miles; Sweetwater River watershed including Lake Loveland and Descanso		Qal, Qp ₄ , Qr, Kgr ₁ , Kgr, Kto ₃ , Kto ₁ , Kb ₁ , M ₃ , M ₂ , M ₁	17-35	Qal	50	<25-50	--	Ca HCO ₃ , Ca-Na HCO ₃	<250- 500	Suitable	Suitable	
					Qr, fractured crystal- line rocks	300	<25-50	--	Variable	<250- 500	Suitable	Suitable	
Z-10.00 Otay Hydrologic Unit													
Z-10.A0 Coronado	Arcuate Peninsula, 9 sq. miles; borders San Diego Bay	Qal, Qp ₁		<11	--	--	--	--	--	--	--	--	
Z-10.B0 Otay	Triangular, 47 sq. miles; extends from Imperial Beach to Lower Otay Reservoir	Qal, Qp ₁ , Tk ₇ , Tk, M ₂	Tk, Tk ₇ , M ₂	<11-17	Qal	170	25-50	Connate water ₃	Na Cl	1,000- 2,000	Marginal (TDS)	Marginal-inferior (Cl)	
					Tk ₇	1,200	<25->100	Mainly connate water	Na Cl	500- 5,000	Suitable-inferior (TDS, NO ₃ , SO ₄)	Marginal-inferior (Cl, % Na, EC)	
Z-10.CO Dulzura	Nearly circular, 100 sq. miles; includes Lower Otay Reservoir and a portion of Jamil		Qal, Qp ₄ , Qp ₁ , Qr, Tk ₇ , Tk, Kgr ₁ , Kto ₁ , Kb ₁ , M ₂	12-19	Qal, Qr, fractured crystal- line rocks	150	<25-75	--	Na Cl, Na-Ca HCO ₃ , variable	250- 1,500	Suitable; locally marginal-inferior (TDS, NO ₃)	Suitable-inferior (Cl)	
Z-11.00 Tia Juana Hydrologic Unit													
Z-11.A0 Tia Juana	Rectangular, 30 sq. miles; Tia Juana River area	Qal, Qp ₁ , Tk ₇ , Tk	M ₂	<11-15	Qal	150	<25-75	Sea water intrusion, connate water ₃	Na Cl	1,000- >5,000	Inferior (TDS); locally marginal (SO ₄)	Inferior (EC, Cl, % Na); locally marginal (EC)	
					Tk ₇	1,300	75->100	Connate water	Na Cl	1,000- 1,500	Marginal-inferior (TDS, F)	Inferior (% Na, Cl)	

DESCRIPTION OF HYDROLOGIC SUBUNITS

(CONTINUED)

AREAL CODE AND NAME OF SUBUNIT ¹	AREAL DESCRIPTION	GEOHYDROLOGY						GROUND WATER QUALITY				
		Rock Type ²		Annual Precipitation inches	Water Bearing Materials	Maximum Drilled Thickness feet	Depth To Water feet	Other Sources Of Ground Water ⁴	Predominant Chemical Character	TDS ppm	Rating (factors exceeding limits for suitable rating) ⁵	
		By Physiographic Section	Mountain- Valley								Domestic Use	Irrigation Use
Z-11.B0 Potrero	Elliptical, 81 sq. miles; Cottonwood Creek watershed		Qal, Qp ₄ , Qr, Kgr ₁ , Kto ₃ , Kbi, M ₂	16-20	Qal, Qr, fractured crystal- line rocks	170	<25-50	--	Variations of Na, Ca, HCO ₃ , Cl	250- 750	Suitable	Suitable; locally marginal (Cl)
Z-11.C0 Barrett Lake	Triangular, 97 sq. miles; lower drainage of Pine Valley Creek and Barrett Lake		Qal, Qr, Kgr ₁ , Kto ₃ , Kto ₁ , Kbi, M ₁	19-25	Qal, Qr, fractured crystal- line rocks	800	--	--	Variable ³	250- 750 ³	Suitable	Suitable
Z-11.D0 Monument	Crescent shaped, 37 sq. miles; upper drainage of Pine Valley Creek including Pine Valley		Qal, Qr, Kgr ₁ , Kto ₃ , Kto ₁ , Kbi, M ₃ , M ₁	25	Qal, Qr, fractured crystal- line rocks	900	<25-50	--	Ca HCO ₃	<250- 500	Suitable	Suitable; locally marginal (Cl)
Z-11.E0 Morene	Crescent shaped, 24 sq. miles; Morena Reservoir area		Qal, Qr, Kgr ₁ , Kto ₃ , Kbi, M ₁	20-25	Qal, Qr, fractured crystal- line rocks	300	--	--	Ca HCO ₃ ³	<250 ³	Suitable ³	Suitable ³
Z-11.F0 Cottonwood	Elongate triangular, 45 sq. miles; headwaters of Cottonwood Creek		Qal, Qr, Kgr ₁ , Kto ₃ , Kto ₂ , Kto ₁ , Kbi, M ₂ , M ₁	20-25	Qal, Qr, fractured crystal- line rocks	--	<25	--	Ca HCO ₃ ³	<250- 750	Suitable	Suitable
Z-11.G0 Cameron	Crescent shaped, 45 sq. miles; La Posta Creek watershed		Qal, Qr, Kgr ₁ , Kto ₂ , Kto ₁ , M ₃ , M ₁	19-20	Qal, Qr, fractured crystal- line rocks	--	<25-50	--	Ca-Na HCO ₃ ³	<250- 500	Suitable	Suitable
Z-11.H0	Triangular, 107 sq. miles; Campo Creek watershed		Qal, Qr, Kgr ₁ , Kto ₃ , Kto ₂ , Kbi	17-20	Qal, Qr, fractured crystal- line rocks	--	25-75	--	Na-Ca HCO ₃ , Ca-Na HCO ₃ , variations	<250- 500	Suitable	Suitable; locally inferior (KNa)

1. See Plate 1.
2. For explanation of rock type, see Plate 2, and for boundaries of physiographic sections, see Illustration on page 14.
3. Based on limited and/or questionable data.
4. Sources other than precipitation and runoff.
5. See Table 8.

Ground water in hydrologic Unit 1 is obtained from more than 150 wells drilled mainly in the alluvium (Plate 6A). Depth to water in these wells is generally less than 50 feet (Plate 8A).

The chemical character of water produced from the alluvium in the San Juan Creek drainage system (San Juan and Arroyo Trabuco Creeks) is generally calcium sulfate toward the coast and calcium bicarbonate inland (Plate 11A). The sulfate is probably derived from gypsiferous deposits occurring within the Miocene marine sediments in the adjacent highlands. Runoff picks up the sulfate (Plate 10) from these sediments and carries it into the Quaternary alluvium.

In general, the concentration of the total dissolved solids of ground water produced from alluvium in the San Juan Creek drainage system ranges from about 250 to more than 2,000 ppm (Plate 9A) with concentrations increasing progressively downstream. These increases can probably be attributed in part to increased utilization. Water produced from the alluvium in San Mateo and San Onofre Creeks is of a calcium-sodium bicarbonate-chloride character. Here, the total dissolved solids content ranges from 250 to 750 ppm.

Around Las Flores Mission, the water appears to be strongly influenced by magnesium. The presence of magnesium can

San Juan Creek Drainage System
in Unit 1, January 1966

Recently, urbanization has been accelerated with the building of extensive new housing tracts.



probably be attributed to the glaucophane schists associated with the San Onofre Breccia.

Ground water around San Mateo, San Onofre, and Las Flores Mission is generally rated suitable for domestic uses. It is also generally rated suitable for irrigation, except at Las Flores Mission where it is marginal. This is because of its high chloride ion concentrations.

The rating of ground water for domestic uses (Plate 12A) in the vicinity of San Juan Creek and Arroyo Trabuco Creek is mainly marginal to inferior with water of suitable rating being present inland. High sulfate ion concentrations are responsible for these marginal and inferior ratings. In this same area, the ground water is rated as suitable to marginal (Plate 13A) for irrigation, with that in occasional localized areas rated as inferior. The marginal and inferior ratings are due to high electrical conductivity and high chloride concentrations.

SANTA MARGARITA HYDROLOGIC UNIT (Z-02.00)

Santa Margarita Hydrologic Unit (Unit 2) is a rectangular-shaped area of about 750 square miles (Plate 1). Included in it are portions of Camp Pendleton as well as the civilian population centers of Murrieta, Temecula, and part of Fallbrook. The unit is considered to be largely unpopulated in that the population centers are small in size as compared to the areal extent of the unit.

This hydrologic unit is drained largely by the Santa Margarita River, Murrieta Creek, and Temecula River. The major surface water storage areas are Vail Lake and O'Neill Lake. Annual precipitation ranges from less than 12 inches near the coast to more than 25 inches inland near Palomar Mountain (Plate 5). Additional information concerning individual hydrologic sub-units is shown on Table 10.

The Santa Margarita Hydrologic Unit lies predominately in the mountain-valley physiographic section. A small strip of the coastal plain physiographic section occurs mainly in the Camp Pendleton area. This coastal strip is composed of Eocene sediments (La Jolla Formation), which are cut by alluvium-filled valleys. The alluvium, which varies from 150 to 200 feet in thickness (Plate 4A) is the principal water-bearing formation in this portion of the unit.

East of Camp Pendleton, the rocks vary from tonalites, granodiorites, gabbros, and metamorphic rocks to residuum, alluvium, and Pleistocene nonmarine sediments (Temecula Arkose), as shown on Plates 2A and 3A. Principal water-bearing materials are



Northwest from Radec Toward
Vail Lake in Unit 2, January 1966

The unit lies predominately in the
mountain-valley physiographic section.

alluvium, Temecula Arkose, and residuum. The residuum, however, has been largely dewatered, and fractured crystalline rocks are now being utilized for water production in many areas. On the other hand, the thick Pleistocene nonmarine sediments (some water wells have been drilled more than 2,000 feet deep) represent a potentially large supply of ground water.

This discussion is based on information obtained from more than 100 wells (Plate 6A) in Unit 2. Depths to water vary widely, but most are less than 75 feet (Plate 8A).

As shown on Plate 11A, the chemical character of ground water near the coast is predominately sodium chloride, and that of water inland is sodium bicarbonate (Temecula-Murrieta area) and calcium bicarbonate (Anza Valley). The total dissolved solids content (Plate 9A) ranges from more than 5,000 ppm near

the coast to about 250 ppm in the Temecula-Murrieta area. There are, however, local areas of high TDS content (750 ppm) near Murrieta and Temecula which probably reflect the influence of water from hot springs. Locally, water rises and issues forth along the northwesterly trending fault zones which traverse the unit. The deep-seated origin of this water is indicated by its high temperature, sodium chloride character, high percent sodium, high chloride, and relatively high fluoride content. These springs contribute chloride both to the ground water (Plate 11A) and to the surface water (Plate 10).

Sea-water intrusion along the coast is indicated by the sodium chloride character of the extracted ground water and a TDS content of more than 5,000 ppm. The predominant chloride ion in the ground water around Fallbrook and the high nitrate and sulfate content can probably be attributed in part to local domestic waste disposal and irrigation practices.

Ground water in the coastal plain section of Unit 2 is generally rated as inferior for domestic uses (Plate 12A) because of a high total dissolved solids content, and that around Fallbrook is inferior because of high nitrate and sulfate content. However, a large portion of Unit 2 contains ground water that is suitable for domestic uses.

Irrigation use ratings (Plate 13A) indicate that the ground water is generally suitable for agriculture although locally it is rated marginal to inferior. Along the coast the ground water is rated as marginal to inferior due to the high chloride content. East of the Temecula-Murrieta area and the Radec area the ground water is locally rated marginal to inferior because of high chloride content and high percent sodium.

SAN LUIS REY HYDROLOGIC UNIT (Z-03.00)

San Luis Rey Hydrologic Unit (Unit 3) is a rectangular-shaped area of about 565 square miles. It includes the population centers of Oceanside, San Luis Rey, and Valley Center as well as portions of Fallbrook and Camp Pendleton. In addition, there are several Indian reservations in the unit. The major stream system, the San Luis Rey River, is interrupted by Lake Henshaw, one of the largest water storage areas in the San Diego Region. However, due to the regional lack of rainfall, Lake Henshaw was only 4.5 percent full in May 1965 (Table 3).

Land in this unit is used mainly for irrigated agriculture, with urban uses increasing seaward. Annual precipitation is heavier than in the other units, ranging from less than 12 inches near the ocean to 45 inches near Palomar Mountain (Plate 5). Table 10 describes the subunits in Unit 3.

Unit 3 occurs almost entirely in the mountain-valley physiographic section with a small strip along the ocean in the coastal plain physiographic section. The coastal plain section is composed of Eocene marine sediments (La Jolla Formation), which are cut by alluvium-filled valleys (Plate 2A). The alluvium reaches a maximum thickness of about 200 feet toward the coast (Plates 3A and 4A), where it is the major water-bearing rock type although some ground water is also extracted from the Eocene sediments.

The mountain-valley section is composed of tonalites, gabbros, granodiorites, and metamorphic rocks, with large valley areas filled with alluvium and Pleistocene nonmarine sediments. The principal water-bearing units are the Pleistocene nonmarine sediments (Pala Fanglomerate and Temecula Arkose), which reach a thickness of 400 feet in the Pauma area (Plate 4A) and 900 feet in the Warner Ranch area. Ground water is also extracted from fractured crystalline rocks and residuum.

The production of ground water in Unit 3 is obtained from more than 250 wells, drilled mainly in the alluvium and Pleistocene nonmarine sediments along the San Luis Rey River Valley. Depths to water from the ground surface (Plate 8A) are variable, but generally they occur within a range of depths less than 25 feet to more than 100 feet. In the coastal section, wells penetrate the alluvium to a maximum depth of about 200 feet. In the Pauma area, wells have been drilled as much as 400 feet deep into the Pala Fanglomerate, and in the Lake Henshaw area, wells more than 900 feet deep have been drilled into the Temecula Arkose (Plate 3A).

The character of the water in the coastal plain section is generally sodium-calcium chloride (Plate 11A) with a total dissolved solids content that ranges from 500 to more than 5,000 ppm (Plate 9A). This reflects sea-water intrusion or connate water invasion.

Further inland, the water becomes calcium sulfate in character. The sulfate ion can probably be attributed in part to the weathering of pyrite and associated minerals within the crystalline rocks, discharge of hot springs, use of chemical fertilizers, and importation of Colorado River water.

In the Pala-Pauma area, the ground water is calcium bicarbonate in character, and in the Valley Center area, it is sodium bicarbonate. Around Lake Henshaw, the ground water character is also calcium to sodium bicarbonate with some sulfate and chloride present due to the influence of Warner Hot Springs and associated springs along fault zones. Lake Henshaw contains runoff of a sodium-calcium bicarbonate character which has a relatively low total dissolved solids content (Plate 10).

The chemical quality of water in the lake is indicative of the surrounding crystalline rocks (Plate 2A) in the watershed.

The ratings of ground water for domestic use (Plate 12A) in the coastal plain section are largely marginal to inferior because of a high total dissolved solids content; however, there are local areas rated as suitable. Farther inland, ratings of ground water for domestic purposes are essentially marginal to inferior because of high sulfate content. Ground water in the Pala-Pauma area is generally rated as suitable. Ground water in the vicinity of Lake Henshaw is rated as suitable for domestic use, but that around Warner Hot Springs is rated as inferior because of the high fluoride content.

Ratings of ground water for irrigation use (Plate 13A) are generally marginal to inferior in the coastal plain section and in the Bonsall area because of the high electrical conductivity and high chloride content. In the rest of the hydrologic unit, ratings of ground water for irrigation



Elsinore Fault Zone Traversing
Unit 3, January 1966

The San Luis Rey River is interrupted by Lake Henshaw, one of the largest water storage areas in the Region.

purposes are essentially suitable, except around the hot springs where high percent sodium leads to inferior ratings.

CARLSBAD HYDROLOGIC UNIT (Z-04.00)

Carlsbad Hydrologic Unit (Unit 4) is a somewhat triangular-shaped area of about 210 square miles, extending from Lake Wohlford on the east to the Pacific Ocean on the west, and from Vista on the north to Cardiff-by-the-Sea on the south. The unit includes within its boundaries the towns of Oceanside, Carlsbad, Leucadia, Encinitas, Cardiff-by-the-Sea, Vista, and Escondido. In the developed area, land use is nearly equally divided between irrigated agriculture and urban-residential.

The area is drained by Buena Vista, Agua Hedionda, San Marcos, and Escondido Creeks. Annual precipitation varies from less than 11 inches near Cardiff-by-the-Sea to 20 inches near Lake Wohlford as shown on Plate 5. The major storage area for this unit is Lake Wohlford. Table 10 presents information concerning the subunits within Unit 4.

Unit 4 occurs both in the coastal plain and mountain-valley physiographic sections. The coastal plain section consists of a strip about 10 miles wide. The topography is relatively flat and averages about 500 feet in elevation. Pleistocene and Eocene marine sediments (La Jolla Formation) are the dominant rock types in this area (Plate 2B). The valleys incised in these sediments have been subsequently backfilled with Recent alluvium. Alluvium and the La Jolla Formation are the major water-bearing sediments in the coastal plain section. Here, the alluvium probably attains a maximum thickness of more than 100 feet.

East of the coastal plain section elevations range from 500 to 2,500 feet. This portion of the unit is composed largely of crystalline rocks, including metamorphic rocks on the west and tonalites and granodiorites on the east. The major water-bearing formations in this portion of the unit are fractured crystalline rocks and residuum.

Production of ground water is from more than 100 wells (Plate 6B) located largely in the Escondido area. Depths to water in this unit are generally 50 feet or less (Plate 8B). Water production in the coastal area is mainly from alluvium and the La Jolla Formation. In the vicinity of Escondido, production is largely from the residuum and fractured crystalline rocks. The wells drilled in the Escondido area are generally less than 150 feet deep, although some wells have been drilled to depths of more than 200 feet (Plate 3B).



Batiquitos Lagoon Formed at the
Mouth of San Marcos Creek in Unit 4,
January 1962

California Division of
Highways

Land use is nearly equally divided
between irrigated agriculture and urban-residential.

The ground water that occurs in the coastal plain section of Unit 4 is generally sodium chloride in character (Plate 11B) and has a concentration of total dissolved solids that ranges from 500 to 5,000 ppm (Plate 9B).

This chemical character is probably the result of brackish waters that occurs in the lagoons. However, it may be the result of sea water and connate water migrating into the alluvium-filled valley areas because of overextractions of the ground water reservoirs.

In the Escondido area, the chemical character of the ground water is generally sodium chloride with subordinate magnesium, calcium, bicarbonate, and nitrate ions. The total dissolved solids content, like the chemical character, is variable and ranges from about 250 to more than 5,000 ppm. The sodium chloride character of the ground water can be largely attributed to local domestic waste disposal practices. In addition, the sodium chloride-sulfate character of surface flow in Escondido Creek (Plate 10) is a result of effluent releases from the waste water treatment plant at Escondido.

Subordinate ions of magnesium and calcium in the ground water near Escondido are related to the geologic environment. Magnesium ions, for example, can be roughly correlated with the gabbroic rocks (Plate 2B) in the Escondido-San Marcos area. The relatively high nitrate concentrations in the Escondido area are attributed largely to local domestic waste disposal practices and in part to the application of chemical fertilizers.

Ratings of ground water for domestic use (Plate 12B) in the coastal plain section range from suitable to inferior. The marginal and inferior ratings are due to a high total dissolved solids content along with high nitrates or high sulfates in local areas. Inland, around Escondido, ground water is generally rated as suitable or inferior for domestic purposes with the inferior ratings usually being due to a high nitrate content.

Ratings of ground water for irrigation use (Plate 13B) for this unit are generally marginal to inferior because of a high electrical conductivity and high chloride. Locally, however, there are areas where the ground water is rated suitable.

SAN DIEGUITO HYDROLOGIC UNIT (Z-05.00)

San Dieguito Hydrologic Unit (Unit 5) is a somewhat rectangular-to elliptical-shaped area of about 350 square miles. The unit includes the San Dieguito River and its tributaries, along with Santa Ysabel and Santa Maria Creeks. It contains the population centers of Ramona, Santa Ysabel, San Pasqual, Escondido, Solana Beach, and Del Mar. The developed area is used primarily for irrigated agriculture with minor urban uses. The unit contains two major reservoirs -- Lake Hodges and Sutherland -- which were 5.0 and 12.3 percent full, respectively, as of May 1965 (Table 3). The annual precipitation ranges from less than 11 inches along the coast to 30 inches just east of Sutherland Reservoir (Plate 5). Additional information concerning the subunits within Unit 5 is presented in Table 10.

Unit 5 lies almost entirely in the mountain-valley physiographic section with a small portion in the coastal plain physiographic section. The coastal plain section consists of the Eocene marine La Jolla Formation. These sediments are in part capped by Pleistocene marine sediments, which have been incised by the San Dieguito River. The alluvial sediments of the San Dieguito River Valley form an important water-bearing formation, as is the La Jolla Formation which locally contains intercalated gypsum beds. The thickness of the alluvium varies, and it reaches a maximum of about 200 feet near San Pasqual (Plate 4B).

Further inland, the mountain-valley section is composed largely of crystalline rocks (Plate 2B): mainly tonalites and granodiorites with some metamorphic rocks, gabbros, and diorites in the easternmost portion of the area. Where fractured and covered by thick residuum, these crystalline rocks are an important source of water. The residuum varies in thickness with the thickest occurrences found in the intermontane basins, such as at Ramona and Santa Ysabel.

More than 250 wells (Plate 6B) provided the information necessary for the evaluation of Unit 5. Depths to water in the coastal plain section are generally less than 25 feet to more than 100 feet. Inland, in the mountain-valley section, depths are usually less than 50 feet (Plate 8B). Ground water is produced from the alluvium and the La Jolla Formation in the coastal plain section and from alluvium, residuum, and fractured crystalline rocks in the inland areas. Most of the wells in residuum are located in the vicinity of Ramona. Wells drilled in the alluvium generally do not exceed 200 feet in depth; but in the crystalline rocks, they have been drilled to a depth of 800 feet and in the La Jolla Formation to nearly 1,000 feet (Plate 3B).

Ground water from the alluvium is generally sodium chloride in character with influences from calcium and bicarbonate ions becoming evident farther inland (Plate 11B). The total dissolved solids content declines from more than 5,000 ppm near the coast to less than 500 ppm inland (Plate 9B).

Water from the La Jolla Formation is generally sodium to calcium chloride in character. The total dissolved solids content generally exceeds 1,000 ppm. This chemical character and total dissolved solids content indicates that connates from these Eocene sediments had been partially flushed out by waters of meteoric origin. Historically, there has been production of ground water from a number of wells in the La Jolla Formation adjacent to the San Dieguito River. Data from these wells suggest a greater movement of connate waters

toward the river from further back in the mesa areas. Over-extractions of ground water from the alluvium-filled valley of the San Dieguito River have caused a landward gradient of the water table (Plate 7), which has resulted in sea-water intrusion and connate-water invasion.

Inland, east of Lake Hodges, the major ions are sodium calcium, chloride, and bicarbonate, which reflect the influences of local waste disposal practices and geologic environment. The water around Ramona is essentially sodium chloride in character, reflecting local waste disposal practices and the influence of waste water treatment plant effluent. Further

Del Mar in Unit 5, January 1966

The coastal plain section has been incised by the San Dieguito River.



inland, the ground water is mainly calcium bicarbonate in character (Plate 11B).

Magnesium ions are either major or subordinate constituents of the ground water in local areas, such as north of Lake Hodges and south of Sutherland Reservoir. This is believed to be directly related to the proximity of gabbroic rocks in the highlands. Sutherland Reservoir, which is located adjacent to gabbroic rocks, has historically contained runoff in which magnesium was either the major or subordinate ion (Plate 10).

Ratings of ground water for domestic uses in the coastal plain section are largely inferior because of a high total dissolved solids content and a high sulfate content (Plate 12B). Inland, ratings are generally suitable except for local areas such as north of Lake Hodges and Ramona where high nitrate and high sulfate concentrations have caused the ground water to be rated as marginal to inferior for domestic purposes.

Irrigation use ratings (Plate 13B) of ground water are mainly inferior in the coastal plain section because of a high electrical conductivity and high chloride. Ground water in the interior is generally rated as suitable except locally where it is rated marginal because of high chloride.

PENASQUITOS HYDROLOGIC UNIT (Z-06.00)

Penasquitos Hydrologic Unit (Unit 6) is a triangular-shaped area of about 170 square miles, extending from Poway on the east to La Jolla on the west. There are no major streams in this unit although it is drained by numerous creeks. Miramar Reservoir, the major storage facility, contains only imported Colorado River water (Table 3). Annual precipitation ranges from less than 8 inches along the ocean to 18 inches inland (Plate 5). Poway, La Jolla, Clairmont, and Linda Vista are the major population centers. The University of California at San Diego, established in 1960, has a campus of more than 1,000 acres. Much of the area is used by Camp Mathews, Camp Elliott, and Miramar Naval Reservation. Excluding the part used by the military, most of the area is utilized for urban purposes. Information pertaining to the subunits of Unit 6 is presented in Table 10.

Most of Unit 6 lies within the coastal plain section, except for the northeastern portion which lies within the mountain-valley section. The dominant rocks (Plate 2B) within the coastal plain section are the Eocene marine sediments (La Jolla Formation) which are in part overlain by a relatively thin



La Jolla in Unit 6, January 1966

Most of the unit lies within
the coastal plain section.

cover of Pleistocene marine deposits. The area is incised by numerous canyons that are partially filled with alluvial deposits.

In the northeasternmost portion of the unit, the predominant crystalline rocks (tonalites, granodiorites, and metamorphic rocks) are locally overlain by a relatively thick cover of residuum. In the Poway area, residuum has a maximum thickness of approximately 70 feet. The alluvium is about 110 feet thick in some of the coastal canyons, and the Eocene sediments are more than 800 feet thick (Plate 3B).

Data from more than 70 selected wells (Plate 6B), located mainly in the northwestern part of the unit and in the Poway area, were utilized for the study of this unit. These wells are usually less than 400 feet deep. They produce water mainly from alluvium and the Eocene La Jolla Formation, with depths to water (Plate 8B) generally occurring at less than 50 feet.

The character of the water (Plate 11B) in the coastal area of Unit 6 varies. Usually it is a sodium chloride water with a total dissolved solids content (Plate 9B) ranging from 1,500 to 5,000 ppm. In the Poway area the water is predominantly sodium chloride in character with secondary influences of sulfate. The total dissolved solids content of the ground water ranges from 750 to 1,500 ppm.

The prevailing sodium chloride character of the ground water found both in the mesas and alluvium-filled valleys of this unit can be largely attributed to connate waters, as in the coastal area; and local waste disposal practices, as in the Poway area.

The marked influence of sulfate in ground water locally in the coastal plain section is probably due in part to the influence of intercalated gypsum beds in the La Jolla Formation.

Ground water in the coastal plain section is generally rated suitable to inferior for domestic purposes (Plate 12B), with a high sulfate and total dissolved solids content causing the marginal to inferior ratings. The marginal rating of ground water for domestic purposes in the inland areas is generally due to the high total dissolved solids content.

Ground water toward the coast is generally rated marginal to inferior for irrigation because of a high chloride ion concentration and a high electrical conductivity (Plate 13B). In the area around Poway, ground water is rated suitable to inferior for irrigation, with the marginal and inferior ratings being due to a high chloride content.

SAN DIEGO HYDROLOGIC UNIT (Z-07.00)

San Diego Hydrologic Unit (Unit 7) is a wedge-shaped area of about 440 square miles drained by the San Diego River. El Capitan, San Vicente, Cuyamaca, Chet Harritt, and Murray Reservoirs are the major storage facilities. San Vicente Reservoir (terminus of the First San Diego Aqueduct), Murray Reservoir, and Chet Harritt Reservoir store mainly Colorado River water; whereas El Capitan mainly stores local runoff and some Colorado River water, and Cuyamaca Reservoir stores only local runoff (Table 3).

Much of the impounded water is used to serve major population centers, including a portion of the San Diego metropolitan area and the communities of El Cajon, Santee, Lakeside, Alpine, and Julian. Utilization of the land is largely for urban residential purposes with agricultural uses being secondary. Annual precipitation ranges from less than 11 inches at the coast to about 35 inches around Cuyamaca and El Capitan Reservoirs. Information on the subunits in Unit 7 is presented in Table 10.

The terraced coastal plain section, consisting largely of the Eocene Poway Conglomerate with lesser amounts of alluvium, has been incised by the San Diego River (Plate 2B). Alluvium near the mouth of the San Diego River is approximately 100 feet thick while that near Lakeside attains a thickness of about 200 feet (Plates 3B and 4C).

Inland, in the mountain-valley section, the dominant crystalline rocks consist mainly of tonalites and metamorphic rocks. In addition, there are scattered areas of residuum and alluvium.

More than 250 selected wells, located largely in the El Cajon area (Plate 6B), provided the data for the study of Unit 7. Depths to water in this unit are generally less than 50 feet (Plate 8B) except for a few areas such as east of Lakeside where depths to water are greater than 75 feet. Wells drilled in the alluvium-filled valley near the coast are usually no more than 75 feet deep, but those in the inland area, west of Lakeside, are generally drilled more than 100 feet deep. In addition, some wells have been drilled to depths in excess of 500 feet in fractured crystalline rocks.

The character of the ground water (Plate 11B) in the coastal plain of Unit 7 is sodium-calcium chloride with a total dissolved solids content (Plate 9B) that ranges from 500 to 5,000 ppm.

In the vicinity of Lakeside and El Cajon, the water is generally sodium chloride in character; however, the presence of sulfate and magnesium ions is notable. The sulfate ions are believed to be due to the use of Colorado River water, local irrigation practices, and geologic environment. The presence of magnesium ions is probably due to the presence of Green Valley Tonalite (Plate 2B) which is relatively high in magnesium.

In addition, the dominant sodium and chloride ions in the ground water around Lakeside and El Cajon appear to be from deep-seated hot springs and sewage effluent in conjunction with local waste disposal practices.

Scattered data available for the far inland area indicate the dominance of calcium and magnesium ions. The dominance of these ions is attributed to the presence of gabbroic rocks. The character of runoff in Cuyamaca Reservoir has tended to be calcium-magnesium bicarbonate (Plate 10) which is also indicative of rock type in the watershed. However, the character of water in the other reservoirs has been strongly influenced by the importation of Colorado River water.

The ratings of ground water for domestic use (Plate 12B) in the coastal plain section are generally marginal to inferior because of the high total dissolved solids content. Ground water in the vicinity of El Cajon is rated suitable or inferior for domestic purposes. The inferior rating for domestic



El Capitan Reservoir in Unit 7,
January 1966

El Capitan mainly stores local
runoff and some Colorado River water.

use is due to a high nitrate content. In the vicinity of Lakeside, ground water is rated suitable to inferior for domestic purposes. The marginal and inferior ratings are due mainly to high total dissolved solids content and a high sulfate concentration. Ground water in the far inland mountain-valley section is generally rated as suitable for domestic purposes.

Ratings of ground water for irrigation use (Plate 13B) in the coastal section are generally inferior because of high electrical conductivity and a high chloride concentration. Rating of ground water in the El Cajon area is generally marginal to inferior for irrigation purposes because of high chloride. Around Lakeside, ground water is rated suitable to inferior, with the marginal and inferior ratings due to a high chloride content.

CORONADO HYDROLOGIC UNIT (Z-08.00)

Coronado Hydrologic Unit (Unit 8) is a triangular-shaped area of about 60 square miles with no major stream system. It is bordered on the north, roughly, by the watershed of the San Diego River and on the south, in part, by that of the Sweetwater River. The major population center is the City of San Diego. Nearly all the area is occupied by urban residential and industrial developments. The unit is relatively dry with an annual precipitation of less than 11 to 13 inches (Plate 5). Additional information on Unit 8 is presented by subunits in Table 10.

Except for the Point Loma area, which consists of the upper Cretaceous Chico Formation, the terraced coastal plain section is underlain by the Pliocene San Diego Formation and the Eocene Poway Conglomerate (Plate 2C). Marine Pleistocene deposits cap these older sediments except where incised by alluvium-filled canyons. As shown on Plate 3C, several wells penetrate the San Diego Formation and underlying Poway Conglomerate to depths of about 800 feet.

Well data from Unit 8 are sparse. Production of ground water has been obtained from wells drilled into the Tertiary sediments. Depth to water in these wells is more than 100 feet (Plate 8C).

The character of the ground water is essentially sodium bicarbonate and sodium chloride (Plate 11C). Deep wells in the Poway Conglomerate produce bicarbonate water and shallow wells in the San Diego Formation produce chloride water. The chloride water probably reflects the marine origin of the San Diego Formation (connate waters), while



National City, Looking East to
San Diego, in Unit 8, January 1966

The major population center
is the City of San Diego.

the bicarbonate water reflects the continental origin of the Poway Conglomerate or indicates that it has been partially flushed. The ground water from these two formations has a total dissolved solids content (Plate 9C) that ranges from 250 to 750 ppm, with the water obtained from the Poway Conglomerate being in the lower range.

Ground water in Unit 8 is rated as suitable for domestic uses, but only suitable to marginal for irrigation purposes because of the high chloride ion concentration (Plates 12C and 13C).

SWEETWATER HYDROLOGIC UNIT (Z-09.00)

Sweetwater Hydrologic Unit (Unit 9) is an elongated north-easterly trending strip with an area of about 230 square

miles. It is traversed along its length by the Sweetwater River. The major population centers include such communities as Chula Vista, Jamul, Spring Valley, and Descanso. Toward the coast land use is largely urban-suburban residential, while inland it is mainly agricultural. The annual precipitation varies from less than 11 inches at the coast to about 35 inches inland (Plate 5). Runoff is stored in Loveland and Sweetwater Reservoirs which were 8.4 and 9.0 percent full as of May 1965 (Table 3). The subunits of Unit 9 are discussed in Table 10.

Unit 9, which is in the coastal plain section, consists of the Pliocene marine San Diego Formation which is capped by Pleistocene marine sediments (Plate 2C). The Pliocene sediments form an important water-bearing formation in the coastal plain section. Ground water is also extracted from the alluvium-filled valley of the Sweetwater River in this area. Further inland, in the mountain-valley section, crystalline rocks are dominant with some alluvium-filled areas present in the larger valleys. Extensive high plateaus occur on the crystalline rock areas, as in the vicinity of Alpine and Descanso.

Ground water is obtained in the mountain-valley section from residuum, fractured crystalline rocks, and from the alluvium-filled valley of the Sweetwater River drainage. Alluvium is generally less than 100 feet thick and the residuum commonly attains thicknesses of more than 100 feet (Plate 3C).

Data on the ground water of this unit are based on approximately 75 wells that have been drilled mainly in the alluvium-filled valley of the Sweetwater River. Depth to water in these wells is generally less than 50 feet (Plate 8C). Wells drilled in the alluvium are generally shallow while those drilled into the San Diego Formation extend to depths of more than 1,000 feet.

In the lower reaches of the Sweetwater River, ground water is sodium-calcium chloride in character (Plate 11C) with a total dissolved solids content that ranges from 2,000 to 5,000 ppm (Plate 9C). The sodium and chloride ions can be attributed to several factors: (1) effluent discharged from the waste water treatment plant (closed in 1963) near the community of Spring Valley, (2) connate waters migrating from the mesa areas into the alluvium-filled valleys, and (3) sea-water intrusion in coastal areas.

Further inland, between Sweetwater and Loveland Reservoirs, the character of the ground water varies greatly. The predominance of sodium and chloride ions in this area is probably due to local waste disposal practices and, possibly, to the influence of hot springs rising along fault zones. Total



Looking East from Alpine
in Unit 9, January 1962

California Division of
Highways

Extensive high plateaus occur
on the crystalline rock areas.

dissolved solids range from 250 to 1,000 ppm. In the furthest inland areas, ground water is calcium bicarbonate in character with a total dissolved solids content of less than 500 ppm.

Ground water in the coastal plain section of this unit is rated inferior for both domestic and irrigation purposes (Plates 12C and 13C). The domestic rating is due to the high total dissolved solids content and the irrigation rating is due to the high chloride ion concentration. Inland, ground water is generally rated as suitable for both domestic and irrigation purposes, except for a few areas where, because of a high boron or chloride ion concentration, the ground water is rated marginal for irrigation uses.

OTAY HYDROLOGIC UNIT (Z-10.00)

Otay Hydrologic Unit (Unit 10) is a club-shaped area of about 160 square miles. The major stream system traversing the area is the Otay River and its tributaries. The Lower Otay Reservoir is the terminus of the Second San Diego Aqueduct. Major population centers include the communities of Imperial Beach and Otay in the coastal area and Dulzura inland. Much of the land is used for irrigated agriculture with urban-residential and commercial uses being secondary. The annual precipitation generally increases landward from the coast and varies from less than 11 to 19 inches (Plate 5). Information on the subunits is presented in Table 10.

The coastal plain section of Unit 10, an area of marine-cut terraces, consists of Pleistocene marine sediments capping the Pliocene marine San Diego Formation (Plate 2C). The maximum thickness of the alluvium is about 200 feet (Plate 3C) in the alluvium-filled valley of the Otay River. The San Diego Formation is generally more than 1,000 feet thick and has been a major water producer. Most of the wells in this formation are 300 to 800 feet deep. In the mountain-valley section, metamorphic rocks predominate with smaller exposures of granodiorite and some areas of residuum and alluvium. Production of water in the mountain-valley section has been largely from residuum and the alluvium-filled valleys.

Data for the study of this unit are based on approximately 80 selected wells as shown on Plate 6C. Production of ground water in the coastal plain section is mainly from the San Diego Formation, where the depth to water in these wells is more than 100 feet (Plate 8C). The depth to water is generally less than 50 feet in the mountain-valley section.

Ground water in the coastal plain section has a sodium-calcium chloride character (Plate 11C) and a total dissolved solids



Lower Otay Reservoir
in Unit 10, January 1966

The southern terminus of the
Second San Diego Aqueduct.

content of 500 to more than 2,000 ppm (Plate 9C). This is attributed mainly to connate water in the San Diego Formation.

Ground water in the mountain-valley section has a TDS content of 250-500 ppm with some local areas as high as 1,000-1,500 ppm. The chemical character is variable, generally sodium-calcium bicarbonate-chloride to sodium-calcium chloride bicarbonate. Locally, high nitrate values are generally associated with waters having high TDS content. The high TDS, nitrate, and chloride values indicate the influence of local waste disposal practices.

The native quality of ground water occurring within Unit 10 can be inferred from the character of the water in Otay

Reservoir before the importation of Colorado River water (Plate 10). These older analyses show the chemical character of the water to be sodium-calcium bicarbonate to sodium-magnesium bicarbonate, which is directly related to the mineral composition of the granodiorites and gabbros which occur in the watershed.

In the coastal plain section, ground water for domestic purposes is rated as suitable to inferior (Plate 12C). The marginal and inferior ratings are due to a high total dissolved solids content; however, in some localities these ratings are due to a high nitrate concentration. Ground water in the mountain-valley section is largely rated as suitable for domestic uses. However, in a few local areas it is rated inferior because of a high nitrate concentration.

For irrigation purposes, ground water in the coastal plain section is rated as marginal to inferior due mainly to a high chloride ion concentration (Plate 13C). The use ratings of ground water for irrigation purposes in the mountain-valley section range from suitable to inferior with the marginal and inferior ratings being essentially due to high chloride.

TIA JUANA HYDROLOGIC UNIT (Z-11.00)

Tia Juana Hydrologic Unit (Unit 11) is a long, wedge-shaped area that is drained by Cottonwood and Campo Creeks, tributaries to the Tia Juana River. It covers an area of about 470 square miles that occurs mainly in the mountain-valley section. The unit is sparsely populated and the major population centers are San Ysidro, Tecate, Potrero, Campo, and Pine Valley. With the exception of San Ysidro, none of these centers is a major urban residential area. The main use of the land is for agricultural purposes.

Annual precipitation, as shown on Plate 5, is less than 11 inches toward the coast, increasing inland to more than 25 inches in the Laguna Mountain area. Runoff is captured by Morena Reservoir and Barrett Lake on Cottonwood Creek. However, due to lack of precipitation, Morena was only 0.7 percent full as of May 1, 1965, and Barrett only 3.5 percent full (Table 3). Further information on the subunits of Unit 11 is presented in Table 10.

The coastal plain section is marked by several terraces in the mesa areas adjacent to the valley of the Tia Juana River. It is made up of Pleistocene marine sediments capping the Pliocene marine San Diego Formation, which are both incised by the partially alluvium-filled valley of the Tia Juana River (Plates 3C and 4C). Production of ground water has



Laguna Mountains, Summit of
Unit 11, January 1966

A spectacular escarpment occurs along
the eastern edge of the Laguna Mountains,
separating the unit from the Anza Borrego Desert.

been from the alluvium (more than 100 feet thick) in the Tia Juana River area and from the San Diego Formation which is penetrated by deep wells in the mesa area. Locally, the San Diego Formation is intercalated with volcanic tuffs. Inland, the mountain-valley section is made up largely of crystalline rocks which, in order of decreasing areal extent, are tonalites, granodiorites, metamorphics, and gabbros. Several broad, alluvium-filled valleys and large residuum areas occur within this section. A spectacular escarpment occurs along the eastern edge of the Laguna Mountains, separating the unit from the Colorado Desert.

The data for the study of Unit 11 are based on more than 200 selected wells, most of which are located in the valley of the Tia Juana River or the adjacent mesa areas (Plate 6C). Depths to water in the alluvium are generally less than 50 feet, but in the mesa areas depths are generally more than 100 feet (Plate 8C). Wells drilled in alluvium of the Tia Juana River Valley generally range from 30 to 100 feet in depth. In the mesa areas, there are many wells that range from about 800 to 1,400 feet in depth.

Only scattered data are available in the inland alluvium-filled valleys and residuum-covered areas. In Pine Valley, for example, the alluvium is generally less than 100 feet thick and is underlain by residuum. Generally, the wells penetrate alluvium and residuum, and locally, the underlying fractured crystalline rocks.

In the coastal plain section of Unit 11, the water is sodium-calcium chloride in character and the total dissolved solids content ranges from about 750 to more than 5,000 ppm, with the higher values predominating (Plates 9C and 11C). The sodium chloride character of ground water from the Tia Juana River area can be largely attributed to sea-water intrusion and connate water invasion as indicated on Plate 7. Connate water in the San Diego Formation is also responsible for the sodium chloride character of ground water from wells in the mesa areas. The high fluoride concentrations of connate water from the mesa areas may be due to the influence of the volcanic tuffs. Another effect on the water character is the water from a waste water treatment plant near San Ysidro which, in 1962, was discharging a sodium sulfate-chloride water. Secondary influences probably include use of Colorado River water and irrigation, with the attendant application of fertilizers.

Ground water in the mountain-valley section generally shows either a sodium bicarbonate or calcium bicarbonate character (Plate 11C). This chemical character reflects the geologic environment (tonalites-granodiorites) as does the surface water collected in Morena and Barrett Reservoirs (Plate 10).

Ratings of ground water for domestic use in the coastal plain section are largely inferior due to high sulfate and high fluoride concentrations (Plate 12C). Ground water in the coastal plain section is rated as largely inferior for irrigation purposes because of a high electrical conductivity, high chloride concentration, and high percent sodium in the mesa areas (Plate 13C).

Ratings of ground water in the mountain-valley section are essentially suitable for domestic and irrigation purposes except locally where the ground water is rated as marginal.

Appendix A

SELECTED REFERENCES

Appendix A

SELECTED REFERENCES

- Babcock, Burt A. "Ground Water Occurrence and Quality, San Diego County". University of Southern California, unpublished Master of Science thesis. June 1958.
- Brennan, R. "Reconnaissance Study of the Chemical Quality of Surface Waters in the Sacramento River Basin, California". United States Geological Survey. Water Supply Paper 1619-Q. 1963.
- California Department of Public Health. "California Domestic Water Supplies". 1962.
- . "Occurrence of Nitrate in Ground Water Supplies in Southern California". February 1963.
- California Department of Public Works, Division of Water Resources. "San Diego County Investigation". Bulletin No. 48. 1935.
- . "Investigation of Possible Boron Pollution from Orange Packing Plants at Escondido". A report to San Diego Regional Water Pollution Control Board (No. 9). March 1952.
- . "Effects of Water Softener Regeneration Wastes, San Diego Region". A report to San Diego Regional Water Pollution Control Board (No. 9). December 1952.
- . "Special Report No. 1 of Referee, Tia Juana Basin". July 1954.
- . "Refuse Disposal Site Investigation, San Diego Region". A report to San Diego Regional Water Pollution Control Board (No. 9). March 1955.
- . "El Cajon Valley Water Quality and Resources, San Diego County". Office Report. December 1955.
- . "Santa Margarita River Investigation". Bulletin No. 57, Volume I: "Text", Volume II: "Appendixes". June 1956.
- California Department of Water Resources. "Feather River Project, Investigation of Alternative Aqueduct Routes to San Diego County". Bulletin No. 61, March 1957.
- . "An Investigation of the Water Quality in Mission Basin, San Luis Rey River Valley, San Diego County". A report to the San Diego Regional Water Pollution Control Board (No. 9). May 1958.
- . "Sea-Water Intrusion in California". Bulletin No. 63. November 1958.

- California Department of Water Resources. "Orange County Land and Water Use Survey, 1957". Bulletin No. 70. January 1959.
- . "Investigation of Alternative Aqueduct Systems to Serve Southern California". Bulletin No. 78, Appendix B: "Effects of Differences in Water Quality, Upper Santa Ana Valley and Coastal San Diego County". January 1959.
- . "San Dieguito River Investigation". Bulletin No. 72, Volume II: "Appendixes". April 1959.
- . "Industrial Waste Disposal Site, Omar Rendering Company, Otay Valley". A report to San Diego Regional Water Pollution Control Board (No. 9). August 1959.
- . "San Dieguito River Investigation". Bulletin No. 72, Volume I: "Text and Plates". November 1959.
- . "Ground Water Geology, San Diego River Valley". A report to the San Diego Regional Water Pollution Control Board (No. 9). December 1959.
- . "Water Quality Conditions and Effects of Recharge with Sewage Effluent in Mission Basin, San Luis Rey River Valley, San Diego County". A report to the San Diego Regional Water Pollution Control Board (No. 9). December 1960.
- . "Otay Valley Industrial Waste Disposal Site". A report to the San Diego Regional Water Pollution Control Board (No. 9). December 1960.
- . "Nelson Oil Refining Company, Vicinity Mouth of Tia Juana River". A report to the San Diego Regional Water Pollution Control Board (No. 9). May 1962.
- . "Boron Pollution of Ground Water at Escondido". A report to the San Diego Regional Water Pollution Control Board (No. 9). June 1962.
- . "San Diego County Flood Hazard Investigation". Bulletin No. 112, Appendix A: "Regional Flood Frequency Analysis". March 1963.
- . "Third Report on Ground Water Quality Conditions in Mission Basin, San Luis Rey River Valley". A report to the San Diego Regional Water Pollution Control Board (No. 9). April 1963.
- . "San Diego County Land and Water Use Survey, 1958". Bulletin No. 102. August 1963.
- . "Fourth Report on Ground Water Quality Conditions in Mission Basin, San Luis Rey River Valley". A report to the San Diego Regional Water Pollution Control Board (No. 9). September 1963.

California Department of Water Resources. "Fifth Report on Ground Water Quality Conditions in Mission Basin, San Luis Rey River Valley". A report to the San Diego Regional Water Pollution Control Board (No. 9). January 1964.

----. "Names and Areal Code Numbers of Hydrologic Areas in the Southern District". April 1964.

----. "Ground Water Occurrence and Quality, Lahontan Region". Bulletin No. 106-1. June 1964.

----. "Ground Water Quality Survey of Lower Otay River Valley". A report to San Diego Regional Water Pollution Control Board (No. 9). June 1964.

----. "San Juan Creek Ground Water Study". A report to San Diego Regional Water Pollution Control Board (No. 9). September 1964.

----. "San Diego County Flood Hazard Investigation". Bulletin No. 112. September 1964.

----. "Crustal Strain and Fault Movement Investigation". Bulletin No. 116-2. January 1964.

----. "Ground Water Conditions in San Diego River Valley". A report to San Diego Regional Water Pollution Control Board (No. 9). September 1965.

----. "Water Quality Report on Pauma, Pala, and Bonsall Ground Water Basins". A report to San Diego Regional Water Quality Control Board (No. 9). December 1965.

----. "Reclamation of Water from Wastes: Coastal San Diego County". Bulletin No. 80-2, Preliminary Edition. February 1966.

----. "Report on Quantity, Quality, and Use of Waste Water in Southern California, July 1, 1963 - June 30, 1964". April 1966.

----. "Hydrologic Data: 1964". Bulletin No. 134-64, Volume V: "Southern California". August 1966.

California Division of Mines. "Geology of Southern California". Bulletin No. 170. 1954.

----. "Mineral Commodities of California". Bulletin No. 176. 1957.

California Division of Mines and Geology. "Geologic Map of California, San Diego-El Centro Sheet". 1962.

----. "Geologic Map of California, Santa Ana Sheet". 1966.

- California State Board of Public Health. "Policy Statement and Resolutions by the State Board of Public Health with Respect to Fluoride Ion Concentrations in Public Water Supplies". August 22, 1958.
- . "Interim Policy on Mineral Quality of Drinking Water". September 4, 1959.
- California State Water Resources Board. "Water Utilization and Requirements of California". Bulletin No. 2. June 1965.
- California Water Quality Control Board, Department of Water Resources, and Department of Public Health. "Detergent Report: A Study of Detergents in California". Prepared for the California State Legislature. January 1965.
- Carpenter, E. J. and Storie, R. E. "Soil Survey of the Capistrano Area, California". United States Department of Agriculture, Bureau of Chemistry and Soils. Soil Survey Report No. 19. 1929.
- Carter, George F. "Pleistocene Man at San Diego". Baltimore: Johns Hopkins Press, 1957.
- Davis, S. N. and Turk, L. J. "Optimum Depth of Wells in Crystalline Rocks". Ground Water Journal of the National Water Well Association, Volume 2, No. 2. 1964.
- Daly, R. A. "Igneous Rocks and the Depths of the Earth". New York: McGraw-Hill Book Company, 1933.
- Ellis, A. J. and Lee, C. H. "Geology and Ground Waters of the Western Part of San Diego County, California". United States Geological Survey. Water-Supply Paper No. 446. 1919.
- Engel, R., Gay, T. E., Jr., and Rogers, B. L. "Geology and Mineral Deposits of the Lake Elsinore Quadrangle, California". California Division of Mines. Bulletin 146. 1959.
- Feth, J. H., Roberson, C. E., and Polzer, W. L. "Sources of Mineral Constituents in Water from Granitic Rocks, Sierra Nevada California and Nevada". United States Geological Survey. Water-Supply Paper 1535-I. 1964.
- Fraser, D. M. "Geology of San Jacinto Quadrangle South of San Geronio Pass, California". California Division of Mines. Report XXVII of the State Mineralogist, Volume 27, No. 4. October 1931.
- Hem, J. D. "Study and Interpretation of the Chemical Characteristics of Natural Water". United States Geological Survey. Water-Supply Paper 1473. 1959.

- Holmes, L. C. and Pendleton, R. L. "Reconnaissance Soil Survey of the San Diego Region, California". United States Department of Agriculture, Bureau of Soils. 1918.
- Jahns, R. H. and Lance, J. F. "Geology of the San Dieguito Pyrophyllite Area, San Diego County, California". California Division of Mines. Special Report No. 4. November 1950.
- Larsen, E. S., Jr. "Batholith and Associated Rocks of Corona, Elsinore, and San Luis Rey Quadrangles, Southern California". Geological Society of America. Memoir 29. June 1948.
- Larsen, E. S., Jr., Everhar, D. L., and Merriam, R. "Crystalline Rocks of South Western California". California Division of Mines. Bulletin 159. 1951.
- Lewis, D. C. and Burgy, R. H. "Hydraulic Characteristics of Fractured and Jointed Rock". Ground Water Journal of the National Water Well Association, Volume 2, No. 3. 1964.
- Mann, J. F., Jr. "Geology of a Portion of the Elsinore Fault Zone, California". California Division of Mines. Special Report No. 43. October 1955.
- McMahon, P. J. and Newport, L. H. "Water Supply Development for Rancho Mission Viejo". American Society of Civil Engineers, Irrigation and Drainage Division. Specialty Conference. 1963.
- Merriam, R. "Ground Water in the Bedrock in Western San Diego County, California". California State Division of Mines, Bulletin No. 159. 1951.
- . "Geology of Santa Ysabel Quadrangle, San Diego County, California. California Division of Mines. Bulletin 177. 1958.
- The Metropolitan Water District of Southern California. "Report for the Fiscal Year 1963 to 1964".
- Olmsted, F. H. "Geologic Features and Water Resources of Campo, Mesa Grande, La Jolla, and Pauma Indian Reservations, San Diego County, California". United States Geological Survey, Ground Water Branch. October 1953.
- . "Geologic Reconnaissance of San Clemente Island, California". United States Geological Survey. Bulletin No. 1071. 1956.
- Piper, A. M. "A Graphic Procedure in the Geochemical Interpretation of Water Analyses". Transactions of American Geophysical Union, Volume 25. 1944.
- Rankama, K. and Sahama, Th. G. "Geochemistry". Chicago: University of Chicago Press, 1950.

- Ruxton, B. P. and Berry, L. "Weathering of Granite and Associated Erosional Features in Hong Kong". Bulletin of the Geological Society of America, Volume 68. October 1957.
- San Diego County Department of Public Health. "An Inventory of Fluoride Ion Concentration in Parts per Million of Domestic Waters in San Diego County". 1960.
- San Diego County Water Authority. "Eighteenth Annual Report". 1964.
- . "Timing of Construction and Sizing of the Second Barrel of the Second San Diego Aqueduct and Proposed Operation of the San Diego County Water System". February 1965.
- San Juan Capistrano Soil Conservation District. "Report on Comprehensive Planning for Conservation of Water and Soil Resources for the Aliso Creek Watershed". December 1961.
- Schelig, John T., Jr. "Geology and Water Resources of Warner Basin, San Diego County, California". University of Southern California, unpublished Master of Science thesis. August 1963.
- Schoellhamer, J. E., et al. "Geologic Map of the Northern Santa Ana Mountains, Orange and Riverside Counties, California". United States Geological Survey. OM 154. 1954.
- Stewart, J. W. "Infiltration and Permeability of Weathered Crystalline Rocks, Georgia Nuclear Laboratory, Dawson County, Georgia". United States Geological Survey. Bulletin 1133-D. 1964.
- Storie, R. E. "The Classification and Evaluation of the Soils of Western San Diego County". University of California, Agricultural Experiment Station. Bulletin 552. June 1933.
- Storie, R. E. and Carpenter, E. J. "Soil Survey of the Oceanside Area, California". United States Department of Agriculture, Bureau of Chemistry and Soils. No. 11. 1929.
- . "Soil Survey of the El Cajon Area, California". United States Department of Agriculture, Bureau of Chemistry and Soils, Soil Survey Report No. 15. 1930.
- Thomas, B. E. "Field Trip Guidebook, San Diego County". San Diego State College, Geology Department. 1961.
- United States Department of Health, Education, and Welfare. "Public Health Service Drinking Water Standards". 1962.
- Vedder, J. G., Yerkes, R. F., and Schoellhamer, J. E. "Geologic Map of the San Joaquin Hills-San Juan Capistrano Area, Orange County, California". United States Geological Survey. OM 193. 1957.

Waring, G. A. "Springs of California". United States Geological Survey.
Water-Supply Paper, No. 338. 1915.

Weber, H. F., Jr. "Geology and Mineral Resources of San Diego County,
California". California Division of Mines and Geology. County
Report No. 3. 1963.

Werner, Sanford L. "Geohydrochemistry of the San Gabriel Valley Area,
Los Angeles County, California". University of Southern California
unpublished Master of Science thesis. January 1965.

Appendix B

DEFINITION OF TERMS
AS USED IN THIS REPORT

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DEFINITION OF TERMS AS USED IN THIS REPORT

Acre-foot. The volume of water required to cover one acre one foot in depth (43,560 cubic feet or 325, 851 gallons).

Anion. A negative ion.

Brackish Water. Water containing more than 1,500, but less than 10,000 parts per million of total dissolved solids.

Brine. Water containing more than 36,000 parts per million of total dissolved solids.

Cation. A positive ion.

Chemical Character of Water. A classification of water based on the predominant chemical constituents, in equivalents per million, for the anion and cation groups.

Combining Weight. The atomic or molecular weight of an ion divided by its ionic charge.

Confined Ground Water. A body of ground water overlain by material sufficiently impervious to sever free hydraulic connection with overlying ground water, except at the area of recharge. Confined ground water moves in conduits under pressure due to the difference in head between the intake and discharge areas of the confined water body.

Connate Water. Water entrapped in the interstices of sedimentary rock at the time the sediments were deposited. This water may be fresh, brackish, or saline in character.

Contamination. Defined in Section 13005 of the California Water Code:
"an impairment of the quality of the waters of the State by sewage or industrial waste to a degree which creates an actual hazard to public health through poisoning or through the spread of disease"

Degradation. Impairment of the quality of water due to causes other than disposal of sewage and industrial waste.

Deterioration. Impairment of water quality.

Electrical Conductivity (E.C.). The reciprocal of the resistance in ohms measured between opposite faces of a centimeter cube of an aqueous solution at a temperature of 25 degrees centigrade.

Equivalent Weight. The value, usually expressed as equivalents per million, obtained by dividing the ion concentration in parts per million by the combining weight of that ion.

Felsenmeer. Defined for this report as a large area resembling a sea of rocks or block field and composed of large subrounded blocks of crystalline bedrock which have remained in situ after the weathering processes have removed the residual matrix. This differs from the original definition which is related to frost heaving.

Geohydrochemistry. A study of the chemical quality of the surface and ground water as it is influenced by the geologic and hydrologic environments and modified by the activities of man.

Hydraulic Gradient. Under unconfined ground water conditions, the slope of the profile of the water table. Under confined ground water conditions, it is the slope of the piezometric surface.

Hydrologic Unit. A classification embracing one of the following features which are defined by surface drainage divides: (1) In general, the total watershed area, including water-bearing and nonwater-bearing formations, such as the total drainage area of the San Diego River Valley; and (2) in coastal areas, two or more small contiguous watersheds having similar hydrologic characteristics, each watershed being directly tributary to the ocean and all watersheds emanating from one mountain body located immediately adjacent to the ocean.

Hydrologic Subunit. A major logical subdivision of a hydrologic unit which includes both water-bearing and nonwater-bearing formations. It is best typified by a major tributary of a stream, a major valley, or a plain along a stream containing one or more ground water basins and having closely related geologic, hydrologic, and topographic characteristics. Subunit boundaries are based primarily on drainage boundaries. However, where strong subsurface evidence indicates that a division of ground water exists, the subunit boundary may be based on subsurface characteristics.

Impairment. A change in quality of water which decreases its suitability for beneficial use.

Industrial Waste. Defined in Section 13005 of the California Water Code:
✓ "any and all liquid or solid water substances, not sewage, from any producing, manufacturing or processing operation of whatever nature".
See correction sheet in front of book.

Overdraft. The average annual decrease in the amount of ground water in storage that occurs during a long period, under a particular set of physical conditions affecting the supply, use, and disposal (including extractions) of water in the ground water reservoir.

Parts Per Million (ppm). One weight of dissolved substance per one million weights of solution at a temperature of 20 degrees centigrade. For practical purposes, ppm is the same as milligrams per liter (mg/l).

Percent Reactance Value. The value, expressed in percent, obtained by dividing the equivalents per million of each ion by the sum of its respective ion group (i.e. the cations or anions).

Percolation. The movement of water through the interstices of soil or other porous media.

Permeability. The capacity of a rock to transmit a fluid. Degree of permeability depends upon the size and shape of the pores, and upon the size, shape, and extent of the pore interconnections.

Pollution. Defined in Section 13005 of the California Water Code:

"An impairment of the quality of the waters of the State by sewage or industrial waste to a degree which does not create an actual hazard to the public health but which does adversely and unreasonably affect such waters for domestic, industrial, agricultural, navigational, recreational, or other beneficial use, or which does adversely and unreasonably affect the ocean waters and bays of the State devoted to public recreation."

Residuum. The residual material formed in situ from weathering of the crystalline bedrock. Residuum includes residual soils, gruss, and decomposed granite.

Saline Water. Water containing more than 10,000, but less than 36,000 parts per million total dissolved solids.

Salt Balance. The relationship of salt input to salt output.

San Diego Region. An area consisting largely of the western watershed of San Diego County and smaller portions of Orange and Riverside Counties. This area is the same as that under the jurisdiction of the San Diego Regional Water Quality Control Board and is also known as the San Diego Drainage Province.

Sewage. Defined in Section 13005 of the California Water Code: "Any and all waste substance, liquid or solid, associated with human habitation, or which contains or may be contaminated with human or animal excreta or excrement, offal, or any feculent matter." As used in this report, sewage is included as part of the waste waters carried by community sewer systems.

Specific Capacity. The number of gallons per minute per foot of drawdown from a pumping well.

Total Dissolved Solids (TDS). The dry residue from the dissolved matter in an aliquot of a water sample remaining after evaporating the sample at a definite temperature.

Total Dissolved Solids by Summation. The TDS as determined by summing the individual dissolved constituents, less one-half the bicarbonate ion.

Total Radioactivity. The combination of alpha, beta, and gamma activity in water reported in picocuries per liter (10⁻¹²curies/liter) or 2.22 disintegrations per minute per liter.

Unconfined Ground Water. Ground water in the zone of saturation not confined beneath an impervious formation and moving under the control of the water table slope.

Water Utilization. The use of all waters by nature or man, whether consumptive or nonconsumptive, including that portion of the applied water which is irrecoverably lost.

Waste Water. Water that has been put to some use or uses and has been disposed of, commonly to a sewer or wasteway. It may be liquid industrial waste or sewage or both.

Appendix C

STATE WELL NUMBERING SYSTEM

Appendix C

STATE WELL NUMBERING SYSTEM

Data from monitored wells and springs presented in this report are assigned numbers which are referenced by the U. S. Public Land Survey System. The well number consists of the township, range, and section numbers; a letter to indicate the 40-acre lot in which the well is located; a number to identify the particular well in the 40-acre lot; and a terminal letter (S) to indicate the San Bernardino Base and Meridian.

Springs are assigned well numbers on the same basis as are water wells, but the letter S is inserted immediately after the lot identification. For example, spring 10S/3W-11GS6, S is the sixth spring assigned a number in Lot G of Section 11 of Township 10 South, Range 3 West, San Bernardino Base and Meridian.

Sections are subdivided into 40-acre lots as shown below

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

For example, well 11S/4W-9E1, S denotes the first well to be assigned a number in Lot E of Section 9 of Township 11 South, Range 4 West, San Bernardino Base and Meridian.

Appendix D

CHEMICAL ANALYSES OF
GROUND WATER FROM SELECTED WELLS

State well number	Temp. when	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million					
	sampled in °F			Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃
Date sampled																	

LAGUNA HYDRO SUBUNIT

201A0

SAN JUAN HYDRO UNIT

20100

65/ 7W- 4E 1 S -- 7.5 1910	100	70	220	1	0	425	454	135	2.7	2.0	1.20	21				538
6-12-61	4.99	5.76	9.57	0.03		6.97	9.45	3.81	0.04							1332
	25	28	47			34	47	19								1216
75/ 8W-160 1 S 82 8.1 1945	6	4	442	10	0	602	81	284	0	0.9	3.90	23				32
6- 7-61	0.30	0.33	19.22	0.26		9.87	1.69	8.01								1156
	1	2	96	1		50	9	41								1151
75/ 8W-180 1 S -- 7.8 2150	104	63	315	2	0	522	326	296	5.5	1.0	0.58	20				519
8-22-63	5.19	5.18	13.70	0.05		8.56	6.79	8.35	0.09							1390
	22	21	57			36	29	35								
75/ 8W-32L 1 S -- 7.6 5680	224	107	919	11	0	533	1826	526	12	1.2	1.64	18				1000
12- 5-60	11.18	8.80	39.96	0.28		8.74	38.02	14.83	0.19							4130
	19	15	66			14	62	24								3908
75/ 8W-33G 1 S -- 7.4 1085	34	33	123	14	0	327	88	105	1.8	0.3	0.53	31				221
6-20-61	1.70	2.71	5.35	0.36		5.36	1.83	2.96	0.03							796
	17	27	53	4		53	18	29								591
75/ 9W-13J 1 S 67 7.7 1810	99	63	200	2	0	677	144	190	1.7	1.2	0.51	30				506
10-20-55	4.94	5.18	8.70	0.05		11.10	3.00	5.36	0.03							1064
	26	27	46			57	15	28								

SAN JUAN HYDRO SUBUNIT

20180

65/ 5W-17H 6-25-64	1 S	59	7.3	710	60 2.99 41	24 1.97 27	54 2.35 32	2 0.05 1	0	245 4.02 53	111 2.31 31	43 1.21 16	0	0.2	0.13	--	515	248
65/ 7W-11J 5-29-64	1 S	--	7.4	807	92 4.59 53	35 2.88 33	28 1.22 14	1 0.03	0	248 4.06 46	205 4.27 49	16 0.45 5	0	0.1	0.08	22	574	374
65/ 7W-11N 11-17-60	2 S	76	7.4	756	104 5.19 63	22 1.81 22	28 1.22 15	1 0.03	0	238 3.90 47	183 3.81 46	22 0.62 7	0.9 0.01	0.2	0.09	20	508 498	350
65/ 7W-11P 11-17-60	1 S	70	7.8	760	114 5.69 69	17 1.40 17	27 1.17 14	1 0.03	0	220 3.61 43	199 4.14 49	23 0.65 8	1.8 0.03	0.2	0.14	21	464 512	355
65/ 7W-128 5-29-64	2 S	--	7.7	753	83 4.14 53	31 2.55 33	24 1.04 13	1 0.03	0	222 3.64 45	191 3.98 50	14 0.39 5	0	0.1	0.06	19	517	335
65/ 7W-12F 5-29-64	1 S	--	8.2	521	77 3.84 73	7 0.58 11	19 0.83 16	1 0.03 1	10 0.33 6	185 3.03 59	63 1.31 26	16 0.45 9	0.9 0.01	0	0.06	--	336	221
65/ 7W-15A 11-14-60	1 S	--	7.2	1082	155 7.73 63	33 2.71 22	41 1.78 15	2 0.05	0	327 5.36 44	258 5.37 44	46 1.30 11	12 0.19 2	0.2	0.19	21	804 729	522
65/ 7W-15A 11-14-60	2 S	65	7.8	1065	148 7.39 62	33 2.71 23	40 1.74 15	2 0.05	0	317 5.20 43	249 5.18 43	49 1.36 11	19 0.31 3	0.2	0.20	20	798 716	505
65/ 7W-17PS1 6-19-64	1 S	--	8.1	1400	158 7.88 47	43 3.54 21	120 5.22 31	6 0.15 1	--	308 5.05 30	390 8.12 49	124 3.50 21	0.7 0.01	0	0.25	20	1176 1013	571
65/ 8W-268 5-29-64	2 S	--	7.6	1848	112 5.59 28	76 6.25 32	180 7.83 40	3 0.08	0	380 6.23 31	434 9.04 45	175 4.94 24	0	0.3	0.13	31	1278 1198	592
75/ 6W- 4ES1 9- 2-64	1 S	--	9.3	--	4 0.20	0	88 3.83	1 0.03	--	-- 0.50	24 1.97	70 1.97	--	8.0	--	--	315	10
75/ 7W- 9G 6-15-61	1 S	--	7.9	585	54 2.69 46	6 0.49 8	62 2.70 46	0	0	177 2.90 50	21 0.44 8	78 2.20 38	16 0.26 4	0.6	0.17	37	378 362	159
75/ 7W-14H 10-20-61	1 S	--	7.5	550	37 1.85 34	2 0.16 3	80 3.48 63	0	0	159 2.61 48	46 0.96 18	67 1.89 35	0	0.8	0.22	30	296 341	101
75/ 7W-19D 10-21-63	2 S		7.4	742	103 5.14 66	13 1.07 14	35 1.52 20	2 0.05 1	--	254 4.16 53	138 2.87 37	27 0.76 10	0.7 0.01	0.5	0.04	21	512 465	311
75/ 7W-320 11-10-60	1 S	--	6.9	1023	88 4.39 41	29 2.38 22	90 3.91 37	1 0.03	0	205 3.36 32	227 4.73 45	82 2.31 22	1.0 0.02	0.5	0.39	20	638 640	339
75/ 7W-32R 1- 8-64	1 S		7.3	1374	74 3.69 28	14 1.15 9	192 8.35 63	2 0.05	0	267 4.38 32	198 4.12 30	178 5.02 37	5.7 0.09 1	0.8	0.47	24	831 820	242

State, well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C as Computed	Total hardness as CaCO ₃	
Date sampled																		

SAN JUAN HYDRO SUBUNIT				SAN JUAN HYDRO UNIT										Z0100									
Z0180																							
7S/ 7W-34NS1 S	95	8.0	870	55	26	63	2	0	254	64	72	11	0.6	0.08	--	440	244						
6-25-64				2.74	2.14	2.74	0.05		4.16	1.33	2.03	0.18					418						
				36	28	36	1		54	17	26	2											
7S/ 7W-35J 1 S	--	6.9	540	44	10	42	2	0	88	53	82	6.8	0.5	0.14	16	298	151						
6-20-61				2.20	0.82	1.83	0.05		1.44	1.10	2.31	0.11					300						
				45	17	37	1		29	22	47	2											
7S/ 7W-36A 1 S	--	7.1	736	65	25	--	--	0	220	108	55	--	--	--	--		265						
5-15-64				3.24	2.06				3.61	2.25	1.55												
7S/ 8W- 10 1 S	77	7.9	2541	217	71	235	13	--	477	462	361	--	--	0.07	--		834						
12-13-62				10.83	5.84	10.22	0.33		7.82	9.62	10.18					1703							
7S/ 8W-13GS1 S	--	7.3	1600	145	51	178	13	0	384	348	213	0	0.8	0.33	23		572						
6-19-64				7.24	4.19	7.74	0.33		6.29	7.25	6.01					1251							
				37	21	40	2		32	37	31					1161							
7S/ 8W-25B 1 S	77	7.9	711	85	19	34	2	--	203	135	41	--	--	0	--		290						
11-29-62				4.24	1.56	1.48	0.05		3.33	2.81	1.16					467							
7S/ 8W-25B 2 S		7.1	788	99	19	37	1	0	227	145	46	1.8	0.3	0.05	18	532	325						
1- 8-64				4.94	1.56	1.61	0.03		3.72	3.02	1.30	0.03				479							
				61	19	20			46	37	16												
7S/ 8W-25B 3 S		7.2	794	100	20	35	1	0	222	153	48	1.6	0.3	0.02	18	517	332						
1- 8-64				4.99	1.64	1.52	0.03		3.64	3.19	1.35	0.03				486							
				61	20	19			44	39	16												
7S/ 8W-25B 4 S		7.2	794	101	19	40	1	0	244	145	44	2.4	0.3	0.05	23	524	330						
1- 8-64				5.04	1.56	1.74	0.03		4.00	3.02	1.24	0.04				496							
				60	19	21			48	36	15												
7S/ 8W-25L 1 S	--	7.9	990	123	24	47	2	0	205	200	88	5.8	0.1	0.15	24		406						
6-12-61				6.14	1.97	2.04	0.05		3.36	4.16	2.48	0.09				762							
				60	19	20			33	41	25	1				615							
7S/ 8W-25N 1 S	67	7.7	4095	282	136	470	2	0	311	1305	510	2.3	0.6	0.44	7		1264						
11-14-60				14.07	11.18	20.44	0.05		5.10	27.17	14.38	0.04				3106							
				31	24	45			11	58	31					2868							
7S/ 8W-25N 2 S	--	7.9	1081	127	28	--	--	0	253	227	76	--	--	--	--		432						
5-14-64				6.34	2.30				4.15	4.73	2.14												
7S/ 8W-25N 3 S	--	7.4	1080	130	24	106	--	0	268	300	80	--	0	0.10	14	70	423						
2-15-61				6.49	1.97	4.61			4.39	6.25	2.26												
7S/ 8W-36C 1 S		7.2	869	105	24	39	2	--	239	170	51	11	0.3	0.05	20	586	361						
10-21-63				5.24	1.97	1.70	0.05		3.92	3.54	1.44	0.18				540							
				58	22	19	1		43	39	16	2											
7S/ 8W-36L 2 S		7.3	1484	125	40	122	3	--	256	327	132	12	0.3	0.04	20	1022	477						
10-21-63				6.24	3.29	5.30	0.08		4.20	6.81	3.72	0.19				907							
				42	22	36	1		28	46	25	1											
7S/ 8W-36P 3 S		7.2	1240	180	7	80	2	--	264	283	91	15	0.3	0.06	20	856	478						
10-21-63				8.98	0.58	3.48	0.05		4.33	5.89	2.57	0.24				808							
				69	4	27			33	45	20	2											
7S/ 8W-36P 4 S	--	8.0	1452	143	35	--	--	0	263	355	129	--	--	--	--		501						
5-14-64				7.14	2.88				4.31	7.39	3.64												
8S/ 7W- 5B 1 S	--	8.0	1375	92	24	176	3	0	262	189	202	8.7	0.7	0.33	20	871	328						
12-11-61				4.59	1.97	7.65	0.08		4.29	3.93	5.70	0.14				845							
				32	14	54	1		31	28	41	1											
8S/ 7W- 5C 2 S		7.7	1653	149	40	159	4	--	287	422	139	--	0.7	0.17	23	1176	537						
10-21-63				7.44	3.29	6.91	0.10		4.70	8.79	3.92												
8S/ 7W- 5E 1 S	--	8.0	1129	110	31	--	--	0	218	290	80	--	--	--	--		402						
5-14-64				5.49	2.55				3.57	6.04	2.26												
8S/ 7W- 5E 2 S	--	7.1	1400	126	39	140	3	0	247	373	124	6.2	0.7	0.40	22		475						
9-28-61				6.29	3.21	6.09	0.08		4.05	7.77	3.50	0.10				1266							
				40	20	39	1		26	50	23	1				956							
8S/ 7W- 6H 1 S		7.1	1955	216	50	146	3	0	281	593	181	0	0.5	0.27	23	1424	745						
1- 8-64				10.78	4.11	6.35	0.08		4.61	12.35	5.10					1351							
				51	19	30			21	56	23												
8S/ 7W- 6H 3 S	--	8.0	1848	175	48	--	--	0	203	582	161	--	--	--	--		635						
5-14-64				8.73	3.95				3.33	12.12	4.54												

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

SAN JUAN HYDRO SUBUNIT				SAN JUAN HYDRO UNIT										20100									
				20180																			
85/ 7W- 6J 2 S 5-14-64	--	7.9	1974	189 9.43	46 3.78	--	--	0	278 4.56	575 11.97	189 5.33	--	--	--	--		661						
85/ 7W- 6J 5 S 1- 8-64		7.4	1882	188 9.38 46	49 4.03 20	160 6.96 34	3 0.08	0	281 4.61 22	532 11.08 53	182 5.13 24	7.7 0.12 1	0.5	0.24	23	1340	671 1284						
85/ 7W- 6K 2 S 5-14-64	--	7.7	1723	182 9.08	46 3.78	--	--	0	264 4.33	536 11.16	143 4.03	--	--	--	--		644						
85/ 7W- 6K 3 S 11-30-62	77	7.3	2118	189 9.43	73 6.00	186 8.09	4 0.10	--	314 5.15	591 12.30	207 5.84	--	--	0.06	--		772 1606						
85/ 7W- 6P 1 S 12-16-58	66	6.9	1585	150 7.49 44	43 3.54 21	133 5.78 34	8 0.20 1	0	207 3.39 20	423 8.81 53	154 4.34 26	4.2 0.07	0.5	0.21	19	1092	552 1037						
85/ 7W- 7C 2 S 12-11-61	--	7.9	1150	110 5.49 45	33 2.71 22	93 4.04 33	3 0.08 1	0	156 2.56 21	315 6.56 54	105 2.96 24	4.3 0.07 1	0.5	0.24	5	765	410 746						
85/ 7W- 7C 3 S 11-30-62	77	7.1	782	73 3.64	21 1.73	56 2.43	2 0.05	--	184 3.02	186 3.87	45 1.27	--	--	0.05	--		269 545						
85/ 7W- 7D 1 S 11-30-62	77	7.2	2074	229 11.43	56 4.61	140 6.09	6 0.15	--	456 7.47	568 11.83	217 6.12	--	--	0.31	--		803 1557						
85/ 8W- 1K 1 S 11-29-62	77	7.8	1640	229 11.43	40 3.29	80 3.48	3 0.08	--	306 5.02	430 8.95	160 4.51	--	--	0.25	--		737 1173						
85/ 8W- 1K 2 S 4-25-62	--	7.1	1524	186 9.28 55	41 3.37 20	95 4.13 24	3 0.08	0	284 4.65 27	390 8.12 48	147 4.15 24	9 0.15 1	0.4	0.06	22	1110	633 1033						
85/ 8W- 1L 1 S 5-14-64	--	8.0	1564	187 9.33	36 2.96	--	--	0	285 4.67	402 8.37	140 3.95	--	--	--	--		615						
85/ 8W- 1L 2 S 11-29-62	77	7.9	1865	240 11.98	50 4.11	92 4.00	4 0.10	--	288 4.72	497 10.35	206 5.81	--	--	0.27	--		805 1363						
85/ 8W- 10 5 S 11-29-62	77	7.8	1882	236 11.78	59 4.85	86 3.74	5 0.13	--	309 5.06	511 10.64	199 5.61	--	--	0.45	--		832 1432						
85/ 8W-128 1 S 12-13-62	77	7.9	1271	138 6.89	37 3.04	73 3.17	9 0.23	--	257 4.21	271 5.64	130 3.67	--	--	0.04	--		497 842						
85/ 8W-12C 1 S 11-10-60	--	7.5	1642	275 13.72 65	44 3.62 17	82 3.57 17	2 0.05	0	332 5.44 29	464 9.66 51	129 3.64 19	3.2 0.05	0.3	0.18	19		868 1118 1182						
85/ 8W-12K 1 S 7-11-52	--	7.2	--	153 7.63	35 2.88	73 3.17	2 0.05	--	288 4.72	296 6.16	108 3.05	--	0.1	0.60	--		526 811						
85/ 8W-12L 1 S 10-21-63		7.4	1848	212 10.58 51	51 4.19 20	131 5.70 28	3 0.08	--	378 6.20 30	480 9.99 48	161 4.54 22	1.1 0.02	0.4	0.10	19	1337	739 1244						
85/ 8W-12L 2 S 8-14-62	77	8.4	1723	19 0.95	84 6.91	220 9.57	10 0.26	39 1.30	473 7.75	126 2.62	258 7.28	--	--	0	--		393 1206						
85/ 8W-12L 3 S 1- 8-64		7.6	1882	236 11.78 53	48 3.95 18	147 6.39 29	3 0.08	0	389 6.38 29	508 10.58 48	180 5.08 23	0	0.3	0.18	19	1364	787 1333						
85/ 8W-12L 4 S 5-14-64	--	8.1	1540	186 9.28	38 3.13	--	--	0	353 5.79	389 8.10	121 3.41	--	--	--	--		621						
85/ 8W-12P 1 S 8-16-62	77	7.3	1815	231 11.53	48 3.95	108 4.70	3 0.08	--	397 6.51	502 10.45	148 4.17	--	--	0	--		775 1271						
85/ 8W-12P 2 S 10-31-61	--	7.1	1955	252 12.57	53 4.36	138 6.00	6 0.15	--	372 6.10	563 11.72	180 5.06	--	--	0.08	--		847 1472						
85/ 8W-12P 3 S 11-29-62	77	8.0	1815	213 10.63	56 4.61	102 4.43	2 0.05	--	377 6.18	497 10.35	141 3.98	--	--	0.25	--		763 1357						

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

SAN JUAN HYDRO SUBUNIT				20180		SAN JUAN HYDRO UNIT					20100									
8S/ 8W-12P 4 S	--	7.6	1910	188	63	201	4	0	314	652	170	9.3	0.7	0.18	23	1468	729			
12-11-61				9.38	5.18	8.74	0.10		5.15	13.57	4.79	0.15								
				40	22	37			22	57	20	1				1465				
8S/ 8W-130 1 S	77	7.3	2054	205	78	145	5	--	392	605	168	--	--	0.06	--		833			
12-13-62				10.23	6.41	6.30	0.13		6.42	12.60	4.74					1493				
8S/ 8W-14H 2 S	--	7.9	2747	309	86	--	--	0	343	777	331	--	--	--	--		1125			
5-14-64				15.42	7.07				5.62	16.18	9.33									
8S/ 8W-14H 3 S	66	7.4	2000	260	57	142	4	--	381	581	202	3.0	0.4	0.19	21		884			
8-12-59				12.97	4.69	6.17	0.10		6.24	12.10	5.70	0.05				1539				
				54	20	26			26	50	24					1458				
8S/ 8W-14J 1 S	--	7.5	--	143	32	79	3	--	322	265	100	--	0.1	0.36	--		489			
7-11-52				7.14	2.63	3.43	0.08		5.28	5.52	2.82					783				
8S/ 8W-140 1 S	--	7.2	4500	480	159	404	6	0	511	1069	830	2.5	0.8	0.31	--	3626	1853			
8-27-64				23.95	13.08	17.57	0.15		8.38	22.26	23.41	0.04								
				44	24	32			15	41	43					3203				
8S/ 8W-23A 2 S	70	7.2	2008	219	63	160	3	0	366	544	214	3.0	0.4	0.20	25	1490	806			
7-16-58				10.93	5.18	6.96	0.08		6.00	11.33	6.03	0.05								
				47	22	30			26	48	26					1412				
8S/ 8W-23A 3 S	72	7.4	1630	228	53	128	5	0	327	498	202	0	0.1	0.22	18	1472	788			
5-18-61				11.38	4.36	5.57	0.13		5.36	10.37	5.70									
				53	20	26	1		25	48	27					1293				
8S/ 8W-23A 4 S	--	7.3	2748	294	97	252	4	0	393	895	287	0.7	0.8	0.27	--	2188	1133			
8-27-64				14.67	7.98	10.96	0.10		6.44	18.63	8.09	0.01								
				44	24	33			19	56	24					2024				
8S/ 8W-23A 7 S		7.7	1993	218	52	165	6	0	324	531	220	0	0.3	0.04	12	1381	759			
2-21-64				10.88	4.28	7.17	0.15		5.31	11.06	6.20									
				48	19	32	1		24	49	27					1364				
SAN CLEMENTE HYDRO SUBUNIT				20100																
9S/ 7W-10A 1 S	77	7.4	780	54	26	81	3	0	190	114	99	0.0	0.6	0.14	--	630	242			
11-23-64				2.69	2.14	3.52	0.08		3.11	2.37	2.79									
				32	25	42	1		38	29	34					471				
9S/ 7W-10A 2 S	--	7.9	800	48	29	99	4	0	204	122	188	0	0.4	0.20	24	552	239			
10-23-63				2.40	2.38	4.30	0.10		3.34	2.54	5.30									
				26	26	47	1		30	23	47					615				
9S/ 7W-10A 3 S	--	7.7	850	49	34	87	4	0	210	147	96	0	0.2	0.15	--	556	263			
7-20-64				2.45	2.80	3.78	0.10		3.44	3.06	2.71									
				27	31	41	1		37	33	29					521				
9S/ 7W-10E 1 S	--	7.1	15600	782	927	4517	82	0	21	1224	1035	1.9	0.3	1.00	6	20410	5768			
9-12-63				39.02	76.24	196.40	2.10		0.34	25.48	29.19	0.03								
				12	24	63	1		1	46	53					8587				
9S/ 7W-10E 2 S	--	7.9	755	44	26	78	4	0	204	100	76	2.5	0.4	0.15	30	438	217			
9-12-63				2.20	2.14	3.39	0.10		3.34	2.08	2.14	0.04								
				28	27	43	1		44	27	28	1				461				
9S/ 7W-10G 1 S	74	7.5	903	60	30	71	4	0	197	116	110	0	0.6	0.33	22	610	273			
7-13-59				2.99	2.47	3.09	0.10		3.23	2.42	3.10									
				35	29	36	1		37	28	35					511				
9S/ 7W-10H 1 S	77	7.4	760	46	24	78	4	0	212	94	78	0.0	0.2	0.15	--	466	214			
11-23-64				2.30	1.97	3.39	0.10		3.47	1.96	2.20									
				30	25	44	1		45	26	29					429				
SAN MATEO HYDRO SUBUNIT				20100																
9S/ 7W-11A 1 S	--	7.9	590	46	19	58	1	0	171	79	67	11	0.2	0.18	23	394	193			
10-24-63				2.30	1.56	2.52	0.03		2.80	1.64	1.89	0.18								
				36	24	39			43	25	29	3				388				
9S/ 7W-11F 1 S	68	--	742	--	--	--	--	--	--	--	100	--	--	0.10	--		244			
4-30-59											2.82									
9S/ 7W-11P 1 S	68	7.0	647	55	16	55	2	0	182	--	63	--	--	--	--		203			
10-29-57				2.74	1.32	2.39	0.05		2.98		1.78									
9S/ 7W-14B 1 S	68	7.0	605	51	20	49	1	0	180	--	60	--	--	--	--		209			
10-29-57				2.54	1.64	2.13	0.03		2.95		1.69									

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date sampled																	

SAN MATEO HYDRO SUBUNIT				20100		SAN JUAN HYDRO UNIT								20100						
95/ 7W-14F 1 S 4-28-59	67	--	866	--	--	--	--	--	--	--	--	115 3.24	--	--	0.20	--	314			
95/ 7W-14G 1 S 10-24-63	64	8.2	750	64 3.19 39	24 1.97 24	69 3.00 37	1 0.03	0	207 3.39 41	100 2.08 25	98 2.76 33	6.3 0.10 1	0.2	0.23	23	506 487	258			
95/ 7W-14L 1 S 10-24-63	64	7.1	1060	74 3.69 30	50 4.11 34	100 4.35 36	2 0.05	0	212 3.47 28	220 4.58 38	147 4.15 34	0	0.4	0.20	19	600 717	390			
95/ 7W-14M 1 S 10-29-57	67	6.9	691	58 2.89	19 1.56	56 2.43	2 0.05	0	181 2.97	--	69 1.95	--	--	--	--	--	223			
SAN ONOFRE HYDRO SUBUNIT				20100																
95/ 6W-180 1 S 4-28-59	66	--	772	--	--	--	--	--	--	--	76 2.14	--	--	0.20	--	248				
95/ 6W-190 1 S 9- 8-60	72	6.9	977	87 4.34 44	25 2.06 21	78 3.39 34	2 0.05 1	0	216 3.54 36	118 2.46 25	129 3.64 37	11.8 0.19 2	0.5	0.35	35	612 593	320			
95/ 7W-13P 1 S 5-26-53	66	--	888	58 2.89	35 2.88	--	--	--	--	--	91 2.57	0.7 0.01	--	--	--	--	289			
95/ 7W-14R 2 S 10-12-53	68	7.2	1140	86 4.29	28 2.30	112 4.87	4 0.10	0	274 4.49	--	130 3.67	30 0.48	--	--	--	--	330			
95/ 7W-14R 3 S 4-23-58	69	--	573	--	--	--	--	--	--	--	68 1.92	--	--	--	--	--	188			
95/ 7W-24A 1 S 9-14-56	73	7.5	990	96 4.79 46	23 1.89 18	84 3.65 35	2 0.05	0	238 3.90 39	127 2.64 26	119 3.36 34	7.4 0.12 1	0.2	0.26	--	627 576	334			
95/ 7W-24C 1 S 4-28-59	66	--	864	--	--	--	--	--	--	--	93 2.62	--	--	0.10	--	--	284			
95/ 7W-240 1 S 4-30-59	67	--	929	--	--	--	--	--	--	--	110 3.10	--	--	0.20	--	--	308			
SAN ONOFRE HYDRO SUBUNIT				20100																
95/ 7W-24H 1 S 10-28-55	68	7.9	857	42 2.10	38 3.13	76 3.30	2 0.05	0	190 3.11	--	96 2.71	--	--	--	--	--	262			
105/ 5W-18M 3 S 10-30-57	71	7.5	1320	77 3.84	36 2.96	154 6.70	2 0.05	0	337 5.52	--	202 5.70	--	--	--	--	--	340			
105/ 5W-18M 4 S 4-28-59	67	--	1340	--	--	--	--	--	--	--	192 5.41	--	--	0.50	--	--	300			
105/ 5W-19E 1 S 10-29-53	66	7.4	1370	81 4.04	50 4.11	142 6.17	4 0.10	0	368 6.03	--	187 5.27	3.8 0.06	--	--	--	--	408			
105/ 5W-31A 1 S 10-30-57	69	7.2	1530	72 3.59	82 6.74	137 5.96	2 0.05	0	340 5.57	--	240 6.77	--	--	--	--	--	517			
105/ 6W-130 2 S 10-30-57	65	7.7	1230	74 3.69	42 3.45	136 5.91	2 0.05	0	358 5.87	--	168 4.74	--	--	--	--	--	357			
105/ 6W-24G 2 S 10-29-57	75	7.7	1340	41 2.05	34 2.80	200 8.70	12 0.31	0	305 5.00	--	226 6.37	--	--	--	--	--	243			
YSIDORA HYDRO SUBUNIT				20240		SANTA MARGARITA HYDRO UNIT								20200						
95/ 3W-18K 1 S 7-27-62	70	7.4	1420	86 4.29 30	69 5.67 39	103 4.48 31	2 0.05	0	145 2.38 16	291 6.06 41	207 5.84 40	22 0.35 2	0.2	0.10	38	962 890	498			
95/ 3W-18P 1 S 4- 2-54	--	8.3	900	84 4.19 41	28 2.30 23	81 3.52 35	4 0.10 1	--	159 2.61 26	262 5.45 54	71 2.00 20	5.5 0.09 1	0.4	0.12	--	650 614	325			

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in									parts per million equivalents per million percent reactance value		Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃			
Date sampled																				

YSIDORA HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT									20200				
9S/ 3W-19D 1 S	70	7.8	1350	84	64	85	3	0	164	146	241	55	0.2	0.12	38	868	473
7-25-62				4.19	5.26	3.70	0.08		2.69	3.04	6.80	0.89					
				32	40	28	1		20	23	51	7				797	
9S/ 3W-19M 1 S	--	7.2	947	60	47	67	3	--	168	107	170	3.0	0.3	0.07	--		343
8-25-54				2.99	3.87	2.91	0.08		2.75	2.23	4.79	0.05				665	
				30	39	30	1		28	23	49	1				540	
9S/ 4W-24R 1 S	--	8.0	1280	76	67	93	3	0	236	225	156	39	0.2	0.15	43	846	465
7-25-62				3.79	5.51	4.04	0.08		3.87	4.68	4.40	0.63				818	
				28	41	30	1		28	34	32	5					
9S/ 4W-25E 2 S	68	7.4	2110	134	103	170	2	0	206	413	367	31	0.4	0.23	38	1442	759
7-25-62				6.69	8.47	7.39	0.05		3.38	8.60	10.35	0.50				1360	
				30	37	33			15	38	45	2					
9S/ 4W-25E 3 S	--	8.0	615	45	12	66	4	--	180	7	87	63.5	0.8	--	--		162
8-24-54				2.25	0.99	2.87	0.10		2.95	0.15	2.45	1.02				395	
				36	16	46	2		45	2	37	16				374	
9S/ 4W-25E 5 S	--	6.9	1698	112	57	162	2	0	82	335	223	158	0.5	0.03	50	1147	514
8- 6-62				5.59	4.69	7.04	0.05		1.34	6.97	6.29	2.55				1140	
				32	27	41			8	41	37	15					
10S/ 4W- 5D 1 S	--	7.8	990	62	22	120	--	--	263	93	110	0.1	0.4	0.05	24		245
1-25-52				3.09	1.81	5.22			4.31	1.94	3.10					694	
				31	18	52			46	21	33					561	
10S/ 4W- 7H 1 S	--	7.7	--	52	30	--	--	--	--	66	124	--	--	--	15		253
6-12-51				2.59	2.47					1.37	3.50					720	
10S/ 4W- 7R 1 S	--	7.5	1100	62	26	141	--	--	285	112	126	0.1	0.5	0.18	24		262
1-10-52				3.09	2.14	6.13			4.67	2.33	3.55					776	
				27	19	54			44	22	34					632	
10S/ 4W-18E 1 S	--	8.1	1030	62	20	126	--	--	264	109	122	0.0	0.4	0.30	24		237
1-10-52				3.09	1.64	5.48			4.33	2.27	3.44					727	
				30	16	54			43	23	34					594	
10S/ 4W-18M 1 S	--	7.8	--	64	76	--	--	--	--	--	56	124	--	--	6		472
11-29-51				3.19	6.25						1.58	2.00				390	
10S/ 4W-18M 2 S	--	7.8	1150	62	19	161	--	0	286	130	124	0.1	0.5	0.40	24		233
1-25-52				3.09	1.56	7.00			4.69	2.71	3.50					806	
				27	13	60			43	25	32					662	
10S/ 5W-13G 1 S	72	7.5	--	120	46	--	--	--	--	37	120	--	--	--	30		489
8-24-51				5.99	3.78					0.77	3.38					351	
10S/ 5W-13J 1 S	--	7.6	--	124	79	--	--	--	--	98	120	--	--	--	15		635
7- 6-51				6.19	6.50					2.04	3.38					598	
10S/ 5W-13R 1 S	--	8.1	--	35	23	--	--	3	238	63	120	--	--	--	20		182
3- 1-49				1.75	1.89			0.10	3.90	1.31	3.38					638	
10S/ 5W-14P 1 S	--	7.4	1270	83	24	172	--	0	268	69	250	1.2	0.5	0.14	24		306
1-11-52				4.14	1.97	7.48			4.39	1.44	7.05	0.02				890	
				30	14	55			34	11	55					756	
10S/ 5W-23J 1 S	--	7.9	1060	58	23	144	--	0	295	98	128	0.3	0.1	0.15	18		239
1-25-52				2.89	1.89	6.26			4.84	2.04	3.61					746	
				26	17	57			46	19	34					615	
10S/ 5W-23J 2 S	--	7.6	--	142	83	--	--	--	--	105	138	--	--	--	10		697
9- 1-50				7.09	6.83					2.19	3.89					612	
10S/ 5W-23J 3 S	67	7.8	--	128	85	--	--	--	--	82	116	--	--	--	15		670
6-22-51				6.39	6.99					1.71	3.27					564	
10S/ 5W-23L 1 S	--	8.1	1470	87	31	212	--	0	308	112	280	0.2	0.4	0.15	24		345
1-22-52				4.34	2.55	9.22			5.05	2.33	7.90					1030	
				27	16	57			33	15	52					898	
10S/ 5W-23O 1 S	--	8.1	2220	31	4	444	2	--	140	90	600	1.0	0.5	0.43	7		94
1-11-52				1.55	0.33	19.31	0.05		2.29	1.87	16.92	0.02				1249	
				7	2	91			11	9	80						
10S/ 5W-24H 1 S	--	7.4	--	135	75	--	--	--	--	51	126	--	--	--	20		646
8-21-50				6.74	6.17					1.06	3.55					785	

State well number	Temp. when	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
	samplerd in °F			Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date samplerd																	

YS100RA HYDRO SUBUNIT				202A0		SANTA MARGARITA HYDRO UNIT					20200								
105/ 5W-24H 3 S	--	--	--	49	17	122	--	--	259	60	131	--	--	--	13		193		
12-18-26				2.45	1.40	5.30			4.25	1.25	3.69					651			
105/ 5W-26L 1 S	72	--	919	--	--	--	--	--	--	--	169	--	--	0.22	--		61		
5-11-55											4.77								
105/ 5W-35J 1 S	--	--	--	134	54	479	--	--	424	198	745	--	--	--	32		557		
11- 9-26				6.69	4.44	20.83			6.95	4.12	21.01					2066			
105/ 5W-35K 1 S	68	7.3	1250	78	31	149	5	0	350	112	163	0.0	--	0.09	35	770	322		
11- 4-57				3.89	2.55	6.48	0.13		5.74	2.33	4.60								
				30	20	50	1		45	18	36					745			
105/ 5W-35K 5 S	72	--	828	--	--	--	--	--	--	--	136	--	--	0.25	--		98		
5-11-55											3.84								
115/ 5W- 1E 1 S	70	7.7	2080	118	57	250	6	0	335	156	430	0.6	--	0.49	30	1230	529		
11- 1-57				5.89	4.69	10.87	0.15		5.49	3.25	12.13	0.01							
				27	22	50	1		26	16	58					1213			
115/ 5W- 2A 1 S	69	7.3	1400	84	39	171	5	0	340	134	220	0.4	--	0.40	27	884	370		
11- 1-57				4.19	3.21	7.44	0.13		5.57	2.79	6.20	0.01							
				28	21	50	1		38	19	43					848			
115/ 5W- 20 3 S	66	7.3	1940	184	83	136	4	0	410	475	185	0.0	--	0.04	32	1370	801		
11- 4-57				9.18	6.83	5.91	0.10		6.72	9.89	5.22								
				42	31	27			31	45	24					1301			
115/ 5W- 2E 1 S	67	7.5	1410	88	33	166	6	0	335	144	213	2.1	--	0.22	27	854	355		
11- 1-57				4.39	2.71	7.22	0.15		5.49	3.00	6.01	0.03							
				30	19	50	1		38	21	41					844			
115/ 5W- 2E 3 S	--	--	--	56	22	142	--	--	275	104	145	--	--	--	26		230		
12-18-26				2.79	1.81	6.17			4.51	2.17	4.09					770			
115/ 5W- 2F 1 S	69	7.4	1320	80	34	161	6	0	325	108	215	0.2	--	0.49	33	812	340		
11- 4-57				3.99	2.80	7.00	0.15		5.33	2.25	6.06								
				29	20	50	1		39	16	44					797			
115/ 5W- 2K 1 S	70	7.2	2890	120	73	382	8	0	330	178	682	0.0	--	0.39	37	1710	600		
11- 4-57				5.99	6.00	16.61	0.20		5.41	3.71	19.23								
				21	21	58	1		19	13	68					1643			
115/ 5W- 2K 2 S	75	7.7	1290	16	10	267	5	0	465	60	152	0.3	--	0.61	18	778	81		
11- 4-57				0.80	0.82	11.61	0.13		7.62	1.25	4.29								
				6	6	87	1		58	9	33					758			
115/ 5W- 2N 2 S	--	--	--	30	9	54	--	--	143	27	60	--	--	--	14		112		
12-18-26				1.50	0.74	2.35			2.34	0.56	1.69					337			
115/ 5W- 2N 3 S	--	--	--	34	25	191	--	--	244	85	224	--	--	--	15		188		
12-18-26				1.70	2.06	8.30			4.00	1.77	6.32					818			
115/ 5W- 2N 4 S	70	7.2	2000	95	58	254	7	0	315	152	430	0.5	--	0.31	29	1260	476		
10-31-57				4.74	4.77	11.04	0.18		5.16	3.16	12.13	0.01							
				23	23	53	1		25	15	59					1181			
115/ 5W- 2P 1 S	70	8.0	--	190	230	--	--	--	--	70	392	--	--	--	15		1421		
8-23-51				9.48	18.92					1.46	11.05					860			
115/ 5W- 9J 1 S	70	7.3	33800	422	1020	6150	108	0	162	1100	12200	4.8	--	2.10	11	23000	5251		
11- 1-57				21.06	83.88	267.40	2.76		2.66	22.90	344.04	0.08							
				6	22	71	1		1	6	93					21098			
115/ 5W-108 1 S	70	7.3	3280	179	79	394	11	0	265	146	900	1.1	--	0.28	36	2020	772		
10-30-57				8.93	6.50	17.13	0.28		4.34	3.04	25.38	0.02							
				27	20	52	1		13	9	77					1877			
OE LUZ HYDRO SUBUNIT				20280															
20280																			
85/ 3W- 7D 3 S	85	7.5	1140	74	52	82	4	0	189	226	142	0	0.4	0.05	--	820	399		
6-23-64				3.69	4.28	3.57	0.10		3.10	4.71	4.00								
				32	37	31	1		26	40	34					673			
85/ 3W-32M 1 S	--	8.0	533	30	22	47	4	0	192	11	69	0.6	0.1	0.06	9		166		
7- 5-60				1.50	1.81	2.04	0.10		3.15	0.23	1.95	0.01				267			
				28	33	37	2		59	4	37					287			
85/ 3W-32M 2 S	--	8.4	680	73	18	39	2	11	272	19	51	1.9	0.2	0.02	59	425	256		
7- 5-60				3.64	1.48	1.70	0.05	0.37	4.46	0.40	1.44	0.03							
				53	22	25	1	6	67	6	21					408			

State well number	Temp. when sampled in °F	pH	Specific conductance (microhmhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C as Computed	Total hardness as CaCO ₃
Date sampled																	

OE LUZ HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT									Z0200					
Z0280																		
85/ 3W-32N 1 S	68	8.1	830	70	39	64	3	0	250	141	99	2.6	0.4	0.03	52	601	335	
6-22-60				3.49	3.21	2.78	0.08		4.10	2.94	2.79	0.04						
				37	34	29	1		42	30	28					594		
85/ 3W-32N 2 S	--	7.8	600	42	23	43	5	0	221	23	70	0.0	0.2	0.70	11	398	200	
4-17-57				2.10	1.89	1.87	0.13		3.62	0.48	1.97							
				35	32	31	2		60	8	32					327		
85/ 3W-32N 3 S	68	7.6	568	72	21	39	3	--	262	34	53	2.5	0.2	0.04	--		266	
4-20-54				3.59	1.73	1.70	0.08		4.29	0.71	1.49	0.04				415		
				51	24	24	1		66	11	23	1				354		
85/ 3W-33K 1 S	60	7.2	550	51	17	55	2	0	228	34	76	0	0.1	0	17	418	197	
3- 6-63				2.54	1.40	2.39	0.05		3.74	0.71	2.14							
				40	22	37	1		57	11	32					364		
85/ 4W-29J 1 S	--	7.6	578	45	18	50	1	0	201	33	64	7.4	0.5	0.03	42	315	187	
8- 6-62				2.25	1.48	2.17	0.03		3.29	0.69	1.80	0.12						
				38	25	37	1		56	12	31	2				360		
85/ 4W-32B 2 S	--	7.4	445	34	9	52	1	--	168	24	46	4.6	0.5	0.08	--		122	
7-27-54				1.70	0.74	2.26	0.03		2.75	0.50	1.30	0.07				314		
				36	16	48	1		60	11	28	2				254		
85/ 4W-34F 1 S	--	7.2	288	23	4	32	1	--	70	23	32	34.3	0.1	0.15	--		74	
8-25-54				1.15	0.33	1.39	0.03		1.15	0.48	0.90	0.55				270		
				40	11	48	1		37	16	29	18				184		
95/ 3W- 1P 3 S	--	7.7	952	58	35	80	4	--	104	35	199	35	0.6	0	--		289	
11-10-53				2.89	2.88	3.48	0.10		1.70	0.73	5.61	0.56				647		
				31	31	37	1		20	8	65	7				498		
95/ 3W- 1P 5 S	--	7.5	458	24	12	53	1	--	110	28	71	11	0.4	0.09	--		110	
11-10-53				1.20	0.99	2.30	0.03		1.80	0.58	2.00	0.18				332		
				27	22	51	1		39	13	44	4				254		
95/ 3W- 10 1 S	64	7.8	1110	69	41	98	4	0	187	70	188	95	0.4	0.07	--	672	341	
6-12-64				3.44	3.37	4.26	0.10		3.06	1.46	5.30	1.53						
				31	30	38	1		27	13	47	13				657		
95/ 3W- 10 2 S	--	7.5	1116	80	50	131	4	--	116	72	330	48.3	0.7	0.07	--		405	
4-20-54				3.99	4.11	5.70	0.10		1.90	1.50	9.31	0.78				897		
				29	30	41	1		14	11	69	6				773		
95/ 3W-12F 3 S	--	8.6	793	46	28	83	4	--	171	42	149	16	0.9	0.05	--		230	
11- 9-53				2.30	2.30	3.61	0.10		2.80	0.87	4.20	0.26				525		
				28	28	43	1		34	11	52	3				453		
95/ 3W-12M 1 S	68	8.0	620	33	21	71	1	0	159	68	75	14	0.6	0.07	--	384	169	
6-12-64				1.65	1.73	3.09	0.03		2.61	1.42	2.12	0.23						
				25	27	48			41	22	33	4				362		
95/ 3W-17C 1 S	72	7.4	1290	83	56	93	4	0	229	167	207	0	0.1	0.08	34	896	438	
7-25-62				4.14	4.61	4.04	0.10		3.75	3.48	5.84							
				32	36	31	1		29	27	45					757		
95/ 4W- 50 1 S	73	7.7	560	37	13	60	2	0	199	22	66	0	0.6	0.08	34	316	146	
7-25-62				1.85	1.07	2.61	0.05		3.26	0.46	1.86							
				33	19	47	1		58	8	33					332		
95/ 4W- 50 2 S	--	7.3	425	52	7	30	3	--	195	9	35	3.9	0.1	0.08	--		159	
8-25-54				2.59	0.58	1.30	0.08		3.20	0.19	0.99	0.06				275		
				57	13	29	2		72	4	22	1				236		
95/ 4W-13P 1 S	--	7.8	1026	74	36	65	3	--	134	67	135	128	0.2	0.04	--		333	
4- 2-54				3.69	2.96	2.83	0.08		2.20	1.39	3.81	2.06				730		
				39	31	30	1		23	15	40	22				574		
95/ 4W-130 1 S	--	6.8	1500	102	65	129	2	--	134	250	261	67.2	0.5	0.22	--		522	
8-25-54				5.09	5.35	5.61	0.05		2.20	5.21	7.36	1.08				1067		
				32	33	35			14	33	46	7				943		
95/ 4W-29C 1 S	--	7.9	--	34	16	--	--	--	--	21	50	--	--	--	24		151	
11-29-51				1.70	1.32					0.44	1.41					220		
95/ 4W-29C 2 S	--	7.6	--	41	11	--	--	--	--	4	76	--	--	--	8		148	
11-29-51				2.05	0.90					0.08	2.14					230		
95/ 4W-29L 1 S	--	7.7	480	31	12	49	--	--	164	23	53	3.3	--	0.06	--		127	
6- 9-53				1.55	0.99	2.13			2.69	0.48	1.49	0.05				250		
				33	21	46			57	10	32	1				252		
MURRIETA HYDRO SUBUNIT				Z02C0														
55/ 1W-320 1 S	64	7.4	2600	317	41	330	3	0	390	884	303	22	0.2	0.20	47	2282	960	
3-20-63				15.82	3.37	14.35	0.08		6.39	18.40	8.54	0.35						
				47	10	43			19	55	25	1				2139		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million			
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃
Date sampled																	

MURRIETA HYDRO SUBUNIT				Z02C0				SANTA MARGARITA HYDRO UNIT										Z0200			
55/ 2W-34P 1 S	--	7.2	1080	89	33	81	--	--	153	47	227	36.8	--	0.06	--		358				
5-12-53				4.44	2.71	3.52			2.51	0.98	6.40	0.59					589				
				42	25	33			24	9	61	6									
65/ 1W- 4J 1 S	80	7.6	605	50	7	58	2	0	183	55	53	13	0.3	0	--	421	154				
10- 1-63				2.50	0.58	2.52	0.05		3.00	1.15	1.49	0.21									
				44	10	45	1		51	20	25	4				328					
65/ 1W- 5G 1 S	--	7.5	720	57	18	79	4	0	233	78	83	7.0	0.4	0.10	28	446	216				
8-21-62				2.84	1.48	3.43	0.10		3.82	1.62	2.34	0.11									
				36	19	44	1		48	21	30	1				469					
65/ 2W- 1A 1 S	--	8.1	820	52	29	76	--	0	153	140	89	10.2	--	0.07	--		249				
4- 7-53				2.59	2.38	3.30			2.51	2.91	2.51	0.16									
				31	29	40			31	36	31	2				471					
65/ 2W- 2G 1 S	--	6.7	1900	162	68	205	8	0	409	422	252	6.0	0.2	0.17	56	1410	684				
3-20-63				8.08	5.59	8.91	0.20		6.70	8.79	7.11	0.10									
				35	25	39	1		30	39	31					1380					
65/ 2W- 2J 1 S	--	7.1	875	78	22	71	4	0	232	120	74	14	0.2	0.09	37	576	285				
1- 8-63				3.89	1.81	3.09	0.10		3.80	2.50	2.09	0.23									
				44	20	35	1		44	29	24	3				534					
65/ 2W- 2N 1 S	--	7.7	940	80	28	80	4	0	201	175	101	11	0.1	0.13	38	654	315				
3-20-63				3.99	2.30	3.48	0.10		3.29	3.64	2.85	0.18									
				40	23	35	1		33	37	29	2				616					
65/ 2W- 2P 1 S	70	7.1	931	85	24	74	5	0	228	141	98	10.6	0.4	0.05	48	638	311				
12-22-60				4.24	1.97	3.22	0.13		3.74	2.94	2.76	0.17									
				44	21	34	1		39	31	29	2				598					
65/ 2W- 3R 2 S	--	7.4	1330	126	31	120	5	0	305	178	184	13	0.4	0.03	39	879	442				
5- 2-63				6.29	2.55	5.22	0.13		5.00	3.71	5.19	0.21									
				44	18	37	1		35	26	37	1				846					
65/ 2W- 9A 1 S	66	7.1	1500	190	31	125	4	0	357	354	162	8.6	0.2	0.14	40	1116	602				
3-20-63				9.48	2.55	5.44	0.10		5.85	7.37	4.57	0.14									
				54	15	31	1		33	41	25	1				1090					
65/ 2W- 9R 1 S	--	7.1	1240	93	29	130	3	0	241	196	151	17	0.2	0.09	42	836	351				
11- 8-62				4.64	2.38	5.65	0.08		3.95	4.08	4.26	0.27									
				36	19	44	1		31	32	34	2				780					
65/ 2W-10D 2 S	--	7.0	1080	94	28	103	3	0	275	158	119	20	0.3	0.12	38	754	350				
5- 2-62				4.69	2.30	4.48	0.08		4.51	3.29	3.36	0.32									
				41	20	39	1		39	29	29	3				699					
65/ 2W-10E 1 S	59	7.6	3815	290	145	552	15	0	312	1753	322	6	0.6	0.48	68	3404	1321				
11-28-56				14.47	11.92	24.00	0.38		5.11	36.50	9.08	0.10									
				29	23	47	1		10	72	18					3305					
65/ 2W-11A 1 S	--	7.7	770	69	25	38	--	--	--	147	33	10.3	--	0.06	--		275				
11- 5-52				3.44	2.06	1.65				3.06	0.93	0.17									
65/ 2W-15D 1 S	62	7.8	680	49	19	76	2	0	268	33	64	32	0.1	0.14	37	474	201				
3-20-63				2.45	1.56	3.30	0.05		4.39	0.69	1.80	0.52									
				33	21	45	1		59	9	24	7				444					
65/ 2W-17N 1 S	--	8.3	13050	248	349	2485	--	--	--	2822	2730	--	--	0.27	--		2056				
5-19-53				12.38	28.70	108.05				58.75	76.99										
65/ 2W-20A 1 S	--	8.2	1900	162	84	98	6	0	268	123	428	30	0.1	0.15	25	1216	750				
3-20-63				8.08	6.91	4.26	0.15		4.39	2.56	12.07	0.48									
				42	36	22	1		23	13	62	2				1088					
65/ 2W-22D 1 S	--	7.4	535	43	7	57	1	0	205	29	36	23	0.4	0.09	34	330	137				
11- 8-62				2.15	0.58	2.48	0.03		3.36	0.60	1.02	0.37									
				41	11	47	1		63	11	19	7				331					
65/ 2W-27N 1 S	--	7.7	690	71	22	45	--	0	214	58	78	12.2	--	0.05	--		268				
5-14-53				3.54	1.81	1.96			3.51	1.21	2.20	0.20									
				48	25	27			49	17	31	3				391					
65/ 2W-28G 2 S	--	7.6	1090	93	27	103	--	0	165	222	135	6.6	--	0.12	--		343				
5-15-53				4.64	2.22	4.48			2.70	4.62	3.81	0.11									
				41	20	40			24	41	34	1				668					
65/ 2W-28G 3 S	67	7.6	967	84	19	98	3	0	186	171	115	8.0	0.6	0.05	38	650	288				
5- 2-63				4.19	1.56	4.26	0.08		3.05	3.56	3.24	0.13									
				42	15	42	1		31	36	32	1				628					
65/ 2W-28J 1 S	--	7.7	1240	103	30	125	2	0	341	160	131	17	0.2	0.12	34	806	381				
11- 7-62				5.14	2.47	5.44	0.05		5.59	3.33	3.69	0.27									
				39	19	42			43	26	29	2				770					
65/ 2W-29R 1 S	--	8.2	790	42	23	99	--	0	238	53	92	14.5	--	0.07	--		200				
4- 7-53				2.10	1.89	4.30			3.90	1.10	2.59	0.23									
				25	23	52			50	14	33	3				441					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃

MURRIETA HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT									Z0200				
65/ 2W-30A 1 S	--	7.0	480	43	12	41	2	0	149	9	71	14	0.2	0.05	31	350	157
11- 7-62				2.15	0.99	1.78	0.05		2.44	0.19	2.00	0.23					
				43	20	36	1		50	4	41	5				296	
65/ 2W-30C 1 S	--	7.8	500	28	18	50	--	0	153	15	53	29	--	0.01	--		144
5-22-53				1.40	1.48	2.17			2.51	0.31	1.49	0.47					
				28	29	43			53	6	31	10				268	
65/ 2W-31L 1 S	--	7.9	960	78	34	66	--	0	287	30	124	18.5	--	0	--		335
5-19-53				3.89	2.80	2.87			4.70	0.62	3.50	0.30					
				41	29	30			52	7	38	3				492	
65/ 2W-32A 1 S	--	7.9	1150	102	31	124	3	0	235	218	149	12.0	0.4	0.04	--		382
1- 7-54				5.09	2.55	5.39	0.08		3.85	4.54	4.20	0.19				755	
				39	19	41	1		30	36	33	1					
65/ 2W-32H 1 S	--	7.7	730	62	23	57	--	0	171	91	89	13.7	--	0.04	--		249
5-15-53				3.09	1.89	2.48			2.80	1.89	2.51	0.22				420	
				41	25	33			38	25	34	3					
65/ 3W-31P 1 S	--	7.7	610	34	25	75	--	--	177	116	71	36.8	--	0	--		188
8-19-52				1.70	2.06	3.26			2.90	2.42	2.00	0.59					
				24	29	46			37	31	25	7				445	
65/ 3W-31R 1 S	--	7.7	730	51	30	70	--	--	232	29	117	2.0	--	0.07	--		251
8-17-52				2.54	2.47	3.04			3.80	0.60	3.30	0.03				413	
				32	31	38			49	8	43						
65/ 3W-34J 1 S	--	7.3	990	67	30	98	1	0	312	66	84	71	0.4	0.38	34	598	291
1-10-63				3.34	2.47	4.26	0.03		5.11	1.37	2.37	1.15				605	
				33	24	42			51	14	24	12					
65/ 4W-260 1 S	--	8.4	350	5	1	82	--	--	98	24	50	1.4	--	0.10	--		17
10-24-52				0.25	0.08	3.57			1.61	0.50	1.41	0.02				212	
				6	2	92			45	14	40	1					
65/ 4W-34J 2 S	--	7.4	850	80	22	75	4	0	126	235	74	0	0.6	0.17	6	626	290
5- 2-62				3.99	1.81	3.26	0.10		2.07	4.89	2.09					559	
				44	20	36	1		23	54	23						
65/ 4W-34J 6 S	--	7.6	620	55	18	53	--	--	244	9	53	27.6	--	0.05	--		211
4-28-53				2.74	1.48	2.30			4.00	0.19	1.49	0.45				338	
				42	23	35			65	3	24	7				336	
65/ 4W-34J 9 S	--	8.3	480	30	14	53	--	--	189	8	43	8.2	--	0.06	--		133
4-28-53				1.50	1.15	2.30			3.10	0.17	1.21	0.13				249	
				30	23	46			67	4	26	3					
65/ 4W-34L 1 S	--	8.0	620	38	23	58	--	--	232	23	67	9.5	--	0.06	--		190
4-27-53				1.90	1.89	2.52			3.80	0.48	1.89	0.15				333	
				30	30	40			60	8	30	2					
65/ 4W-34M 1 S	--	8.2	580	32	18	65	--	--	207	16	67	17.5	--	0.04	--		154
4-28-53				1.60	1.48	2.83			3.39	0.33	1.89	0.28				317	
				27	25	48			58	6	32	5					
65/ 4W-340 2 S	--	7.8	470	30	20	38	--	--	171	13	25	32.7	--	0.12	--		157
4-27-53				1.50	1.64	1.65			2.80	0.27	0.71	0.53				243	
				31	34	34			65	6	16	12					
65/ 4W-340 7 S	--	7.3	510	39	17	42	1	0	177	25	36	40	0.2	0.07	34	352	168
1- 9-63				1.95	1.40	1.83	0.03		2.90	0.52	1.02	0.65				321	
				37	27	35	1		57	10	20	13					
65/ 4W-34R 1 S	--	8.4	600	40	26	49	--	--	238	20	43	47.5	--	0.07	--		207
4-27-53				2.00	2.14	2.13			3.90	0.42	1.21	0.77				343	
				32	34	34			62	7	19	12					
65/ 4W-34R 3 S	--	7.8	660	48	26	53	--	--	226	20	60	39.3	--	0.02	--		227
4-27-53				2.40	2.14	2.30			3.70	0.42	1.69	0.63				357	
				35	31	34			57	7	26	10					
65/ 4W-350 1 S	72	7.5	611	50	16	50	1	0	146	22	108	17	0.2	0.02	30	378	191
5- 3-63				2.50	1.32	2.17	0.03		2.39	0.46	3.05	0.27				366	
				42	22	36			39	7	49	4					
65/ 4W-35F 1 S	--	8.3	940	66	27	90	--	--	232	51	149	13.3	--	0.01	--		276
4-22-53				3.29	2.22	3.91			3.80	1.06	4.20	0.21				510	
				35	24	42			41	11	45	2					
65/ 4W-35M 2 S	--	8.3	540	44	25	58	--	--	238	34	53	18	--	0.10	--		213
10-29-52				2.20	2.06	2.52			3.90	0.71	1.49	0.29				349	
				32	30	37			61	11	23	5					
65/ 4W-35N 1 S	--	8.3	510	28	16	56	--	--	183	14	57	4.0	--	0.03	--		136
4-30-53				1.40	1.32	2.43			3.00	0.29	1.61	0.06				265	
				27	26	47			60	6	32	1					
65/ 4W-350 1 S	--	8.4	690	52	19	69	--	--	201	42	92	15	--	0.03	--		208
2-20-53				2.59	1.56	3.00			3.29	0.87	2.59	0.24				388	
				36	22	42			47	12	37	3					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

MURRIETA HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT										20200					
202C0																			
6S/ 4W-360 1 S	--	7.6	560	34	18	53	--	--	146	15	82	44.9	--	0.10	--		159		
4-22-53				1.70	1.48	2.30			2.39	0.31	2.31	0.72					319		
				31	27	42			42	5	40	13							
7S/ 2W- 40 1 S	--	8.0	1240	96	33	101	--	--	262	92	192	15	--	0.05	--		375		
5-19-53				4.79	2.71	4.39			4.29	1.92	5.41	0.24					658		
				40	23	37			36	16	46	2							
7S/ 2W- 50 1 S	--	7.3	1300	107	32	120	1	0	233	218	164	9	0.2	0.14	34	856	399		
12- 7-62				5.34	2.63	5.22	0.03		3.82	4.54	4.62	0.15					800		
				40	20	39			29	35	35	1							
7S/ 2W-33E 1 S	--	7.6	400	30	11	41	1	0	146	12	39	25	0.2	0.05	38	274	120		
12-21-62				1.50	0.90	1.78	0.03		2.39	0.25	1.10	0.40					269		
				36	21	42	1		58	6	27	10							
7S/ 3W- 20 1 S	--	7.9	380	29	10	37	--	--	153	25	35	4	--	0.10	--		114		
8-19-52				1.45	0.82	1.61			2.51	0.52	0.99	0.06					215		
				37	21	41			62	13	24	1							
7S/ 3W- 5L 1 S	--	7.6	1250	85	36	139	--	--	281	145	206	2	--	0.40	--		360		
7-30-52				4.24	2.96	6.04			4.61	3.02	5.81	0.03					752		
				32	22	46			34	22	43								
7S/ 3W- 7R 2 S	--	7.9	754	23	1	129	2	0	122	42	144	9.3	0.6	0.07	18		62		
9-12-61				1.15	0.08	5.61	0.05		2.00	0.87	4.06	0.15					417		
				17	1	81	1		28	12	57	2					429		
7S/ 3W- 7R 3 S	--	7.8	700	52	16	75	1	0	235	41	84	0	0.2	0.12	25	402	196		
1-10-63				2.59	1.32	3.26	0.03		3.85	0.85	2.37						410		
				36	18	45			54	12	34								
7S/ 3W-12J 1 S	--	7.7	470	36	18	37	--	--	134	13	39	54	--	0.05	--		164		
5-25-53				1.80	1.48	1.61			2.20	0.27	1.10	0.87					263		
				37	30	33			50	6	25	20							
7S/ 3W-15N 1 S	--	7.4	565	41	11	57	2	0	204	20	66	0	0.2	0	52	316	148		
11-27-56				2.05	0.90	2.48	0.05		3.34	0.42	1.86						350		
				37	16	45	1		59	7	33								
7S/ 3W-16N 2 S	--	8.6	960	101	31	69	--	--	329	20	112	58	--	0.05	--		380		
5-12-53				5.04	2.55	3.00			5.39	0.42	3.16	0.94					553		
				48	24	28			54	4	32	9							
7S/ 3W-16N 3 S	--	7.6	870	89	24	62	--	--	293	29	99	55	--	0.07	--		321		
8-15-52				4.44	1.97	2.70			4.80	0.60	2.79	0.89					502		
				49	22	30			53	7	31	10							
7S/ 3W-16N 5 S	--	8.5	770	76	29	--	--	--	275	27	106	23	--	0.08	--		309		
5-20-53				3.79	2.38				4.51	0.56	2.99	0.37							
7S/ 3W-170 1 S	--	8.5	630	26	8	106	--	--	177	38	96	2.0	--	0.27	--		98		
7-22-52				1.30	0.66	4.61			2.90	0.79	2.71	0.03					363		
				20	10	70			45	12	42								
7S/ 3W-17E 3 S	--	7.7	610	55	21	--	--	--	256	21	60	23	--	0.14	--		224		
7-22-53				2.74	1.73				4.20	0.44	1.69	0.37							
7S/ 3W-17E 4 S	--	7.5	770	66	24	56	1	0	262	35	93	3	0.1	0.05	--	446	263		
7-15-64				3.29	1.97	2.43	0.03		4.29	0.73	2.62	0.05					407		
				43	26	31			56	9	34	1							
7S/ 3W-17F 3 S	--	7.3	538	25	10	70	7	--	128	40	71	19	0.5	0.01	--		104		
10-14-53				1.25	0.82	3.04	0.18		2.10	0.83	2.00	0.31					305		
				24	16	57	3		40	16	36	6							
7S/ 3W-17G 1 S	--	7.9	510	18	4	91	--	--	165	16	74	6.9	--	0.03	--		62		
5- 7-53				0.90	0.33	3.96			2.70	0.33	2.09	0.11					291		
				17	6	76			52	6	40	2							
7S/ 3W-17H 1 S	--	8.0	710	64	18	69	--	--	256	27	96	7.6	--	0.03	--		234		
5- 7-53				3.19	1.48	3.00			4.20	0.56	2.71	0.12					407		
				42	19	39			55	7	36	2							
7S/ 3W-17H 2 S	--	7.9	762	69	16	62	0	0	232	36	105	9.4	0.2	0.04	30	455	238		
11-22-57				3.44	1.32	2.70			3.80	0.75	2.96	0.19					442		
				46	18	36			50	10	39	2							
7S/ 3W-17P 2 S	--	8.0	950	80	28	84	1	0	299	40	137	12	0.1	0.05	--	558	315		
7-15-64				3.99	2.30	3.65	0.03		4.90	0.83	3.86	0.19					529		
				40	23	37			50	8	39	2							
7S/ 3W-18A 1 S	--	8.0	530	44	17	50	--	--	214	16	53	21	--	0.05	--		180		
5- 6-53				2.20	1.40	2.17			3.51	0.33	1.49	0.34					306		
				38	24	38			62	6	26	6							
7S/ 3W-18M 1 S	--	7.5	620	39	28	61	--	--	220	67	60	1.1	--	0.25	--		213		
5- 6-53				1.95	2.30	2.65			3.61	1.39	1.69	0.02					364		
				28	33	38			54	21	25								

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed
Date sampled																

MURRIETA HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT										20200				
				202C0														
75/ 3W-19A 1 S	--	8.2	700	52	21	58	--	--	226	36	78	7.0	--	0.10	--		216	
7-17-52				2.59	1.73	2.52			3.70	0.75	2.20	0.11						
				38	25	37			55	11	33	2					363	
75/ 3W-19A 2 S	--	8.5	510	44	18	36	--	--	189	20	46	12	--	0.09	--		184	
7-17-52				2.20	1.48	1.57			3.10	0.42	1.30	0.19						
				42	28	30			62	8	26	4					269	
75/ 3W-20A 3 S	--	7.5	866	83	25	66	1	0	298	36	103	29	0.3	0.10	50	520	310	
5-21-59				4.14	2.06	2.87	0.03		4.88	0.75	2.90	0.47						
				45	23	32			54	8	32	5					540	
75/ 3W-20A 4 S	--	7.9	779	70	24	63	1	0	273	41	89	16	0.4	0.10	40	480	273	
5-21-59				3.49	1.97	2.74	0.03		4.47	0.85	2.51	0.26						
				42	24	33			55	11	31	3					479	
75/ 3W-20A 9 S	--	7.9	846	80	27	65	1	0	312	35	97	27	0.4	0.10	40	505	311	
5-21-59				3.99	2.22	2.83	0.03		5.11	0.73	2.74	0.44						
				44	24	31			57	8	30	5					526	
75/ 3W-20A10 S	72	7.5	818	74	26	63	1	0	283	33	98	26	0.3	0.06	50	490	292	
5-21-59				3.69	2.14	2.74	0.03		4.64	0.69	2.76	0.42						
				43	25	32			55	8	32	5					510	
75/ 3W-20A14 S	--	7.7	768	58	24	70	2	0	259	37	91	23	0.4	0.22	30	465	243	
5-21-59				2.89	1.97	3.04	0.05		4.25	0.77	2.57	0.37						
				36	25	38	1		53	10	32	5					463	
75/ 3W-20B 3 S	--	8.0	866	82	27	66	1	0	315	33	103	26	0.3	0.06	40	520	316	
5-21-59				4.09	2.22	2.87	0.03		5.16	0.69	2.90	0.42						
				44	24	31			56	8	32	5					533	
75/ 3W-20C 4 S	--	8.2	1481	102	35	162	1	--	336	103	234	39	0.1	0	--		399	
4- 9-54				5.09	2.88	7.04	0.03		5.51	2.14	6.60	0.63						
				34	19	47			37	14	44	4					880 841	
75/ 3W-20D 1 S	--	7.9	1670	196	14	155	--	--	500	111	234	1.9	--	0.07	--		547	
5-21-53				9.78	1.15	6.74			8.20	2.31	6.60	0.03						
				55	7	38			48	13	39						958	
75/ 3W-20G 4 S	--	7.7	710	51	23	60	2	0	244	35	78	8.0	0.2	0.05	29	430	222	
1-10-63				2.54	1.89	2.61	0.05		4.00	0.73	2.20	0.13						
				36	27	37	1		57	10	31	2					406	
75/ 3W-20H 1 S	--	7.5	740	66	21	70	--	--	256	31	89	38	--	0.29	--		251	
7-11-52				3.29	1.73	3.04			4.20	0.65	2.51	0.61						
				41	21	38			53	8	31	8					441	
75/ 3W-21D 1 S	--	8.2	660	58	18	75	--	--	256	29	82	19	--	0.10	--		219	
11- 5-52				2.89	1.48	3.26			4.20	0.60	2.31	0.31						
				38	19	43			57	8	31	4					407	
75/ 3W-21D 2 S	--	7.5	688	67	16	52	1	0	232	17	83	14	0.4	0.03	41	416	233	
5- 2-63				3.34	1.32	2.26	0.03		3.80	0.35	2.34	0.23						
				48	19	33			57	5	35	3					405	
75/ 3W-21F 2 S	--	8.5	654	58	16	54	--	--	232	16	67	8.5	0.3	0.04	--		211	
9- 2-53				2.89	1.32	2.35			3.80	0.33	1.89	0.14						
				44	20	36			62	5	31	2					374 334	
75/ 3W-21M 3 S	--	8.3	740	62	20	58	1	0	241	33	92	16	0.1	0	33		237	
11-22-57				3.09	1.64	2.52	0.03		3.95	0.69	2.59	0.26						
				42	23	35			53	9	35	3					452 434	
75/ 3W-21P 1 S	--	7.9	750	68	26	94	--	--	268	83	114	3.7	--	0.11	--		277	
11- 3-52				3.39	2.14	4.09			4.39	1.73	3.21	0.06						
				35	22	43			47	18	34	1					521	
75/ 3W-21Q 1 S	--	7.9	560	56	11	61	--	--	201	22	64	12	--	0.11	--		185	
7-11-52				2.79	0.90	2.65			3.29	0.46	1.80	0.19						
				44	14	42			57	8	31	3					325	
75/ 3W-24D 3 S	--	7.7	440	28	1	69	1	0	128	17	65	5	0.4	0.20	--		240	
7-16-64				1.40	0.08	3.00	0.03		2.10	0.35	1.83	0.08						
				31	2	67	1		48	8	42	2					250	
75/ 3W-27H 2 S	--	8.1	1500	59	17	244	--	--	177	77	369	4.4	--	2.49	--		217	
7-10-52				2.94	1.40	10.61			2.90	1.60	10.41	0.07						
				20	9	71			19	11	69						860	
75/ 3W-27N 2 S	--	7.7	980	76	22	109	1	--	287	70	149	5.3	0.5	0.12	--		280	
4-23-54				3.79	1.81	4.74	0.03		4.70	1.46	4.20	0.09						
				37	17	46			45	14	40	1					608 574	
75/ 3W-27N 3 S	68	7.7	980	78	23	105	1	0	295	71	140	8.0	0.3	0.17	29	620	289	
5- 1-62				3.89	1.89	4.57	0.03		4.84	1.48	3.95	0.13						
				37	18	44			47	14	38	1					600	
75/ 3W-27P 1 S	--	7.3	1800	106	47	195	2	0	307	139	334	3.0	0.2	0.31	22	1106	458	
1-10-63				5.29	3.87	8.48	0.05		5.03	2.89	9.42	0.05						
				30	22	48			29	17	54						999	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃

MURRIETA HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT													
				20200							20200						
75/ 3W-28R 1 S	71	7.2	595	51	12	56	2	0	211	13	80	6.8	0.2	0.18	49	362	177
3- 7-60				2.54 42	0.99 16	2.43 40	0.05 1		3.46 57	0.27 4	2.26 37	0.11 2					374
75/ 3W-29A 1 S	--	7.7	500	26	11	47	--	--	165	52	11	1.8	--	0.10	--		110
4-21-53				1.30 31	0.90 21	2.04 48			2.70 66	1.08 26	0.31 8	0.03 1					230
75/ 3W-29J 1 S	--	7.5	630	36	19	58	--	--	183	62	64	2.1	--	0.01	--		168
4-21-53				1.80 31	1.56 27	2.52 43			3.00 49	1.29 21	1.80 29	0.03					331
75/ 4W- 1A 1 S	--	7.5	650	36	17	72	--	--	201	18	82	10	--	0.12	--		160
9- 2-52				1.80 28	1.40 22	3.13 49			3.29 54	0.37 6	2.31 38	0.16 3					334
75/ 4W- 1E 1 S	--	8.5	640	50	20	57	--	0	232	12	64	28	--	0.04	--		207
4-30-53				2.50 38	1.64 25	2.48 37			3.80 60	0.25 4	1.80 29	0.45 7					345
75/ 4W- 1P 2 S	--	8.5	1640	132	50	160	--	--	366	179	256	17	--	--	--		535
4-30-53				6.59 37	4.11 23	6.96 39			6.00 35	3.73 22	7.22 42	0.27 2					974
75/ 4W- 1Q 2 S	--	7.8	630	44	17	71	--	0	226	21	57	23	--	0.12	--		180
7- 4-52				2.20 33	1.40 21	3.09 46			3.70 60	0.44 7	1.61 26	0.37 6					344
75/ 4W- 1Q 3 S	--	7.8	612	--	--	--	--	0	211	--	83	--	--	--	--		175
11-21-57									3.46		2.34						
75/ 4W- 1Q 5 S	--	8.6	1430	80	32	178	--	--	305	74	263	9.7	--	0.13	--		331
5- 1-53				3.99 28	2.63 18	7.74 54			5.00 35	1.54 11	7.42 53	0.16 1					787
75/ 4W- 2B 2 S	--	8.0	745	49	16	93	1	0	222	52	103	9	0.2	0.05	--	446	189
7-15-64				2.45 31	1.32 17	4.04 52	0.03		3.64 47	1.08 14	2.90 37	0.15 2					432
75/ 4W- 2G 2 S	--	7.5	583	42	18	44	--	0	151	35	62	8.1	0.5	0	--	341	179
5-15-52				2.10 38	1.48 27	1.91 35			2.47 49	0.73 14	1.75 34	0.13 3					284
75/ 4W- 3A 3 S	--	8.3	670	54	26	47	--	--	262	20	71	10	--	0.01	--		242
4-30-53				2.69 39	2.14 31	2.04 30			4.29 62	0.42 6	2.00 29	0.16 2					357
75/ 4W-11A 1 S	--	7.7	730	58	18	69	--	--	201	71	89	2.5	--	0.05	--		219
2-11-53				2.89 39	1.48 20	3.00 41			3.29 45	1.48 20	2.51 34	0.04 1					406
75/ 4W-12D 1 S	--	7.5	770	68	18	71	5	0	150	59	124	0	0.2	0.05	17	476	244
1- 9-63				3.39 42	1.48 18	3.09 38	0.13 2		2.46 34	1.23 17	3.50 49						436
75/ 4W-12G 1 S	--	8.6	700	50	25	--	--	--	238	55	75	6.7	--	0.01	--		228
4-30-53				2.50	2.06				3.90	1.15	2.12	0.11					
75/ 4W-12H 2 S	--	7.3	400	31	6	45	1	0	104	14	57	25	0.1	0.12	--	248	102
7-15-64				1.55 39	0.49 12	1.96 49	0.03 1		1.70 43	0.29 7	1.61 40	0.40 10					230
85/ 2W- 7A 1 S	--	--	340	3	1	67	--	18	52	10	50	1	--	--	--	202	12
0- 0-39				0.15 5	0.08 3	2.91 93		0.60 19	0.85 28	0.21 7	1.41 46	0.02 1					176
85/ 3W- 1P 2 S	--	7.7	410	14	7	59	--	--	122	7	60	15	--	0.03	--		64
5-19-53				0.70 18	0.58 15	2.57 67			2.00 49	0.15 4	1.69 41	0.24 6					222
85/ 3W-12C 1 S	--	7.3	270	20	5	30	3	0	104	8	23	12	0.2	0.07	33		71
12-21-62				1.00 36	0.41 15	1.30 47	0.08 3		1.70 63	0.17 6	0.65 24	0.19 7					172 185
85/ 3W-12N 5 S	--	7.8	1020	55	18	143	1	0	227	97	169	0	0.4	0.24	17	618	211
5- 1-62				2.74 26	1.48 14	6.22 59	0.03		3.72 35	2.02 19	4.77 45						612
85/ 3W-12N13 5	--	8.3	1500	74	32	242	1	--	433	109	238	15	0.4	0.41	--		316
11- 0-53				3.69 22	2.63 16	10.52 62	0.03		7.10 44	2.27 14	6.71 41	0.24 1					984 925
85/ 3W-12O 2 S	--	8.3	500	36	18	60	--	--	177	3	71	19	--	0.01	--		164
1-11-53				1.80 31	1.48 25	2.61 44			2.90 55	0.06 1	2.00 38	0.31 6					294
85/ 3W-13K 1 S	--	8.1	410	11	6	62	--	--	116	12	50	21	--	0.11	--		52
5- 6-53				0.55 15	0.49 13	2.70 72			1.90 49	0.25 6	1.41 36	0.34 9					219

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃	
Date sampled																		

SANTA MARGARITA HYDRO UNIT																			
AULD HYDRO SUBUNIT										20200									
6S/ 1E-25J 1 S	64	7.0	870	73	33	78	5	0	220	195	57	45	0.8	0.09	33	618	318		
12-12-62				3.64	2.71	3.39	0.13		3.61	4.06	1.61	0.73							
				37	27	34	1		36	41	16	7							
6S/ 1E-25R 2 S	57	7.9	960	93	35	74	5	0	214	77	15	0.4	--	0.04	24	666	376		
12-12-62				4.64	2.88	3.22	0.13		3.51	1.60	0.42	0.01							
				43	26	30	1		63	29	8								
6S/ 1E-36L 1 S	--	7.3	530	45	12	47	2	0	217	17	48	0	0.4	0.09	22	292	162		
12-12-62				2.25	0.99	2.04	0.05		3.56	0.35	1.35								
				42	19	38	1		68	7	26								
6S/ 1W-31N 1 S	--	8.4	1540	102	50	152	--	0	244	292	227	17.1	--	0.07	--		460		
9-18-52				5.09	4.11	6.61			4.00	6.08	6.40	0.28							
				32	26	42			24	36	38	2							
7S/ 1E- 1R 1 S	--	7.1	550	53	14	50	5	0	201	39	60	28	0.2	0.04	22	374	190		
12-12-62				2.64	1.15	2.17	0.13		3.29	0.81	1.69	0.45							
				43	19	36	2		53	13	27	7							
7S/ 1E- 4G 1 S	--	7.4	420	38	10	45	2	0	201	10	50	13	0.4	0.07	24	266	136		
12-11-62				1.90	0.82	1.96	0.05		3.29	0.21	1.41	0.21							
				40	17	41	1		64	4	28	4							
7S/ 1E- 4P 1 S	--	7.7	450	38	9	51	2	0	205	0	42	9.0	0.4	0.09	22	242	132		
12-11-62				1.90	0.74	2.22	0.05		3.36		1.18	0.15							
				39	15	45	1		72		25	3							
7S/ 1E- 6K 1 S	--	7.3	540	43	13	48	3	0	202	25	59	2.0	0.6	0.08	27	322	161		
12-11-62				2.15	1.07	2.09	0.08		3.31	0.52	1.66	0.03							
				40	20	39	1		60	9	30	1							
7S/ 1E- 7B 2 S	--	7.8	1120	42	25	190	4	477	24	132	14	0.6	--	0.22	28	686	208		
12-11-62				2.10	2.06	8.26	0.10	15.90	0.39	2.75	0.39	0.01							
				17	16	66	1	82	2	14	2								
7S/ 1E- 7E 4 S	--	7.3	680	58	15	63	3	0	261	24	67	7.0	0.2	0.11	27	414	206		
12-11-62				2.89	1.23	2.74	0.08		4.28	0.50	1.89	0.11							
				42	18	39	1		63	7	28	2							
7S/ 1E- 8D 1 S	--	7.9	750	47	14	115	3	0	350	19	74	8.0	0.4	0.17	29	494	175		
12-11-62				2.35	1.15	5.00	0.08		5.74	0.40	2.09	0.13							
				27	13	58	1		69	5	25	2							
7S/ 1W- 9P 1 S	--	8.2	830	44	22	103	3	0	284	68	78	15	0.5	0.06	34	489	201		
12-21-62				2.20	1.81	4.48	0.08		4.65	1.42	2.20	0.24							
				26	21	52	1		55	17	26	3							
7S/ 1W-10R 1 S	--	8.5	1160	58	35	162	--	--	433	86	128	6.1	--	0.17	--		289		
5-26-53				2.89	2.88	7.04			7.10	1.79	3.61	0.10							
				23	22	55			56	14	29	1							
7S/ 1W-12H 1 S	60	7.0	1120	87	41	105	6	0	342	189	131	0	0.6	0.11	29	734	386		
12-13-62				4.34	3.37	4.57	0.15		5.61	3.93	3.69								
				35	27	37	1		42	30	28								
7S/ 1W-12K 1 S	62	7.1	985	79	23	90	5	0	236	134	122	0	0.2	0.22	27	612	292		
12-13-62				3.94	1.89	3.91	0.13		3.87	2.79	3.44								
				40	19	40	1		38	28	34								
7S/ 1W-14A 1 S	--	7.9	755	66	19	98	4	0	324	29	67	24	0.6	0.13	47	488	243		
12-13-62				3.29	1.56	4.26	0.10		5.31	0.60	1.89	0.39							
				36	17	46	1		65	7	23	5							
7S/ 1W-14J 1 S	--	7.5	835	62	21	98	3	0	301	29	103	26	0.2	0.58	33	500	241		
12-13-62				3.09	1.73	4.26	0.08		4.93	0.60	2.90	0.42							
				34	19	47	1		56	7	33	5							
7S/ 1W-18J 1 S	--	7.7	670	37	23	74	--	--	201	25	92	21.1	--	0	--		187		
5-26-53				1.85	1.89	3.22			3.29	0.52	2.59	0.34							
				27	27	46			49	8	38	5							
7S/ 1W-18D 2 S	--	8.2	780	46	19	96	6	0	265	49	94	2.5	0.7	0.06	44	476	193		
5- 2-63				2.30	1.56	4.17	0.15		4.34	1.02	2.65	0.04							
				28	19	51	2		54	13	33								
7S/ 1W-30N 1 S	--	7.9	910	57	20	99	--	--	250	15	146	11.5	--	0.08	--		224		
5-19-53				2.84	1.64	4.30			4.10	0.31	4.12	0.19							
				32	19	49			47	4	47	2							
7S/ 2W- 2M 1 S	--	8.4	686	65	26	42	1	0	222	50	75	8.0	0.3	0.02	52	465	269		
12-21-62				3.24	2.14	1.83	0.03		3.64	1.04	2.12	0.13							
				45	30	25			53	15	31	2							
7S/ 2W- 2P 2 S	70	8.2	1440	98	38	143	1	0	339	131	209	11	0.4	0.07	--		401		
11-28-56				4.89	3.13	6.22	0.03		5.56	2.73	5.89	0.18							
				34	22	44			39	19	41	1							
7S/ 2W- 4J 2 S	--	6.5	720	58	17	46	--	--	208	55	71	12.3	--	0.07	--		215		
8-26-52				2.89	1.40	2.00			3.41	1.15	2.00	0.20							
				46	22	32			50	17	30	3							

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃

AULD HYDRO SUBUNIT				20200		SANTA MARGARITA HYDRO UNIT										20200					
75/ 2W- 4K 1 S 4- 7-53	--	7.5	1090	95 4.74 43	25 2.06 19	96 4.17 38	--	--	374 6.13 48	111 2.31 18	149 4.20 33	9.9 0.16 1	--	0.06	--		340				
																670					
75/ 2W- 8M 1 S 4- 7-53	--	8.2	2660	160 7.98 28	91 7.48 26	306 13.30 46	--	--	360 5.90 21	423 8.81 31	482 13.59 48	11.3 0.18 1	--	0.14	--		774				
																1650					
75/ 2W- 8M 1 S 8-22-52	--	8.1	2630	121 6.04 22	83 6.83 25	329 14.30 53	--	--	232 3.80 14	437 9.10 33	517 14.58 53	3.5 0.06	--	0.14	--		644				
																1605					
75/ 2W-10D 1 S 12-21-62	--	7.5	1490	82 4.09 27	41 3.37 22	180 7.83 51	1 0.03	0	365 5.98 40	153 3.19 21	204 5.75 38	9.0 0.15 1	0.4	0.23	30	906	373				
																880					
75/ 2W-140 1 S 12-21-62	--	7.7	1310	137 6.84 50	35 2.88 21	88 3.83 28	4 0.10 1	0	89 1.46 12	297 6.18 50	165 4.65 38	7.0 0.11 1	0.2	0.08	28	846	486				
																805					
75/ 2W-20P 1 S 8-26-52	--	8.1	400	31 1.55 41	7 0.58 15	38 1.65 44	--	--	134 2.20 63	7 0.15 4	25 0.71 20	25.7 0.41 12	--	0.60	--		107				
																200					
75/ 2W-21E 1 S 1- 9-63	--	7.4	500	46 2.30 45	16 1.32 26	34 1.48 29	1 0.03 1	0	219 3.59 72	14 0.29 6	35 0.99 20	9.0 0.15 3	0.2	0.07	36	322	181				
																299					
75/ 2W-26N 1 S 12-21-62	--	7.7	680	45 2.25 31	14 1.15 16	85 3.70 52	2 0.05 1	0	196 3.21 46	24 0.50 7	110 3.10 44	12 0.19 3	0.2	0.08	37	408	170				
																426					
75/ 2W-30D 1 S 11- 9-62	--	8.2	445	14 0.70 17	2 0.16 4	72 3.13 77	2 0.05 1	0	88 1.44 38	12 0.25 7	71 2.00 53	7.0 0.11 3	2.0	0.60	20		43				
																246					
75/ 3W-12H 1 S 11- 9-62	--	7.8	610	45 2.25 35	30 2.47 39	36 1.57 25	2 0.05 1	0	171 2.80 45	27 0.56 9	76 2.14 35	41 0.66 11	0.2	0.12	29	416	236				
																370					
75/ 3W-24A 1 S 5- 2-63	--	8.0	540	29 1.45 28	7 0.58 11	73 3.17 61	1 0.03 1	0	1 0.02 1	25 0.52 19	73 2.06 73	13 0.21 7	0.6	0.08	21	320	102				
																243					
75/ 3W-25E 1 S 2-26-59	--	7.9	481	16 0.80 20	6 0.49 12	63 2.74 67	1 0.03 1	0	105 1.72 44	8 0.17 4	64 1.80 46	14 0.23 6	0.4	0.34	20	314	65				
																244					
75/ 3W-25M 1 S 3- 3-38	--	--	348	--	--	69 3.00	--	21 0.70	85 1.39	15 0.31	39 1.10	--	--	0.24	--						
75/ 3W-35B 1 S 5- 2-63	--	8.3	487	19 0.95 20	0	85 3.70 79	1 0.03 1	0	101 1.66 36	16 0.33 7	85 2.40 53	11 0.18 4	0.4	0.20	17	284	48				
																284					
75/ 3W-35B 2 S 0- 0-39	--	--	630	12 0.60 11	1 0.08 1	112 4.87 88	--	--	88 1.44 26	23 0.48 9	128 3.61 65	4 0.06 1	--	--	--	369	34				
																323					
PECHANGA HYDRO SUBUNIT				202E0																	
85/ 2W-11J 1 S 6-10-60	--	8.2	1290	--	--	--	--	0	265 4.34	--	151 4.26	--	--	--	--		358				
85/ 2W-11L 1 S 1-18-63	--	7.5	1290	110 5.49 41	28 2.30 17	130 5.65 42	4 0.10 1	0	300 4.92 37	206 4.29 32	145 4.09 30	9.0 0.15 1	0.4	0.20	20	870	390				
																800					
85/ 2W-11P 1 S 8- 5-52	--	9.2	450	2 0.10	1 0.08	111 4.83	--	24 0.80	104 1.70	50 1.04	50 1.41	--	--	0.80	13	354	9				
85/ 2W-12H 1 S 5-26-54	--	7.9	923	74 3.69 40	20 1.64 18	89 3.87 42	3 0.08 1	--	256 4.20 44	126 2.62 27	96 2.71 28	7.0 0.11 1	0.4	0.22	--		267				
																607 541					
85/ 2W-12J 1 S 1-18-63	--	7.7	1400	99 4.94 33	30 2.47 16	175 7.61 50	5 0.13 1	0	329 5.39 36	255 5.31 36	145 4.09 28	4.0 0.06	0.4	0.31	21	926	371				
																896					
85/ 2W-12K 1 S 2- 9-51	--	8.0	980	71 3.54 36	9 0.74 7	129 5.61 57	--	--	268 4.39 40	163 3.39 31	106 2.99 28	4.7 0.08 1	--	0	--		214				
																614					
85/ 2W-15C 1 S 5-26-54	--	8.9	500	3 0.15 3	2 0.16 3	107 4.65 93	1 0.03 1	3 0.10	159 2.61 54	4 0.08 2	69 1.95 41	4.2 0.07 1	1.5	0.70	--		16				
																301 274					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃

PECHANGA HYDRO SUBUNIT				202E0		SANTA MARGARITA HYDRO UNIT										Z0200					
8S/ 2W-16A 1 S 5-26-54	--	8.2	643	34	8	88	2	--	171	7	103	15	0.6	0.20	--		118				
				1.70 27	0.66 11	3.83 61	0.05 1		2.80 46	0.15 2	2.90 48	0.24 4			376 342						
8S/ 2W-16G 1 S 5-26-54	--	8.3	652	15	1	112	2	--	134	31	103	16	0.6	0.25	--		42				
				0.75 13	0.08 1	4.87 85	0.05 1		2.20 37	0.65 11	2.90 48	0.26 4			378 347						
8S/ 2W-17G 1 S 2- 9-51	--	8.6	530	5	1	113	--	57	0	28	92	15	--	0.26	--		17				
				0.25 5	0.08 2	4.91 94		1.90 36		0.58 11	2.59 49	0.24 5			311						
8S/ 2W-17M 1 S 1-18-63	--	9.1	450	8	0	96	1	21	103	10	60	3.0	4.0	0.77	15	286	20				
				0.40 9		4.17 91	0.03 1	0.70 16	1.69 39	0.21 5	1.69 39	0.05 1			269						
8S/ 2W-19J 1 S 7- 0-10	--	--	--	52	16	43	--	12	193	17	50	28	--	--	37	369	196				
				2.59 45	1.32 23	1.87 32		0.40 7	3.16 55	0.35 6	1.44 24	0.45 8			350						
8S/ 2W-19Q 1 S 8- 7-62	--	7.5	440	39	10	37	0	0	134	15	51	30	0.2	0.02	42	264	139				
				1.95 45	0.82 19	1.61 37			2.20 50	0.31 7	1.44 33	0.48 11			290						
8S/ 2W-20B 4 S 1-18-63	--	7.7	780	57	11	93	3	0	189	111	86	6.0	0.4	0.18	16	588	187				
				2.84 36	0.90 11	4.04 51	0.08 1		3.10 39	2.31 29	2.43 31	0.10 1			476						
8S/ 2W-20L 1 S 0- 0-39	--	--	475	47	9	42	--	--	207	17	35	6	--	--	--	363	155				
				2.35 48	0.74 15	1.83 37			3.39 70	0.35 7	0.99 20	0.10 2			258						
8S/ 2W-22L 1 S 3-12-53	--	8.2	340	14	8	48	--	--	116	3	50	1.4	--	0.01	--		68				
				0.70 20	0.66 19	2.09 61			1.90 56	0.06 2	1.41 42	0.02 1			181						
8S/ 2W-28M 1 S 5- 1-62	70	8.5	420	12	1	75	1	2	81	16	70	0	2.5	0.72	13		34				
				0.60 15	0.08 2	3.26 82	0.03 1	0.07 2	1.33 36	0.33 9	1.97 53				302 233						
8S/ 2W-29G 1 S 3-25-52	--	7.9	630	38	13	75	--	--	177	50	85	2.7	--	--	--		149				
				1.90 30	1.07 17	3.26 52			2.90 45	1.04 16	2.40 38	0.04 1			351						
8S/ 3W-24A 1 S 5- 8-59	--	6.9	467	26	13	51	2	0	128	24	64	1.2	0.5	0.08	42	318	119				
				1.30 28	1.07 23	2.22 48	0.05 1		2.10 48	0.50 11	1.80 41	0.02			287						
8S/ 3W-24H 2 S 5- 8-59	--	7.1	333	22	4	35	3	0	98	10	38	37	0.5	0.21	51	224	72				
				1.10 36	0.33 11	1.52 50	0.08 3		1.61 46	0.21 6	1.07 31	0.60 17			249						
8S/ 3W-33Q 1 S 1-18-63	--	7.0	1390	122	53	93	4	0	357	125	208	7.0	0.2	0.20	26	988	523				
				6.09 42	4.36 30	4.04 28	0.10 1		5.85 41	2.60 18	5.87 41	0.11 1			814						
WILSON HYDRO SUBUNIT				Z02F0																	
7S/ 1E-13P 1 S 12-13-62	--	7.2	1160	90	51	107	7	0	333	257	94	0	0.6	0.15	16	792	434				
				4.49 33	4.19 31	4.65 34	0.18 1		5.46 41	5.35 40	2.65 20				786						
7S/ 1E-17G 1 S 12-12-62	--	7.4	540	44	11	68	1	0	238	14	63	0	0.4	0.11	26	336	155				
				2.20 36	0.90 15	2.96 49	0.03		3.90 65	0.29 5	1.78 30				345						
7S/ 1E-18K 1 S 12-12-62	--	7.0	600	42	18	59	4	0	172	54	73	0	0.6	0.09	29	372	179				
				2.10 34	1.48 24	2.57 41	0.10 2		2.82 47	1.12 19	2.06 34				364						
7S/ 1E-20Q 1 S 10-30-62	74	7.8	470	33	10	50	2	0	188	7	48	6.5	0.4	0.14	29	285	124				
				1.65 35	0.82 17	2.17 46	0.05 1		3.08 66	0.15 3	1.35 29	0.10 2			288						
7S/ 1E-24F 1 S 12-13-62	--	7.8	1080	102	30	93	6	0	321	214	76	0	0.6	0.15	24	710	378				
				5.09 43	2.47 21	4.04 34	0.15 1		5.26 44	4.46 38	2.14 18				704						
7S/ 1E-24Q 1 S 12-13-62	--	7.8	780	44	15	91	3	0	271	32	76	0	0.4	0.11	21	400	172				
				2.20 29	1.23 16	3.96 53	0.08 1		4.44 61	0.67 9	2.14 30				416						
7S/ 1E-26K 1 S 12-13-62	68	6.9	680	46	10	87	3	0	207	13	113	0	0.4	0.07	3	346	156				
				2.30 33	0.82 12	3.78 54	0.08 1		3.39 49	0.27 4	3.19 47				377						
7S/ 1E-29E 1 S 10-30-62	--	7.7	532	35	12	58	2	0	200	8	58	13	0.5	0.08	39	310	137				
				1.75 33	0.99 19	2.52 47	0.05 1		3.28 62	0.17 3	1.64 31	0.21 4			324						

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed
Date sampled																

WILSON HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT										Z0200					
Z02F0																			
75/ 1E-30H 1 S	--	7.8	720	42	20	107	--	0	287	51	85	6.2	--	0.05	--		187		
2- 2-51				2.10	1.64	4.65			4.70	1.06	2.40	0.10							
				25	20	55			57	13	29	1					452		
75/ 1E-30H 2 S	--	7.5	1256	97	46	105	6	0	193	312	125	1.0	0.7	0.10	39	855	431		
10-30-62				4.84	3.78	4.57	0.15		3.16	6.50	3.53	0.02							
				36	28	34	1		24	49	27						827		
75/ 1E-30J 2 S	--	7.7	1000	62	33	129	--	0	268	130	152	3.3	--	0.10	--		290		
2- 2-51				3.09	2.71	5.61			4.39	2.71	4.29	0.05							
				27	24	49			38	24	38						641		
75/ 1E-30J 3 S	--	7.8	1656	123	58	151	5	0	417	191	232	12	0.5	0.15	42	1060	546		
10-30-62				6.14	4.77	6.57	0.13		6.83	3.98	6.54	0.19							
				35	27	37	1		39	23	37	1					1020		
75/ 1E-30J 4 S	68	7.9	762	48	18	86	3	0	246	61	82	3.5	0.5	0.12	40	450	194		
10-30-62				2.40	1.48	3.74	0.08		4.03	1.27	2.31	0.06							
				31	19	49	1		53	17	30	1					463		
85/ 1E- 70 1 S	--	7.5	1250	73	27	257	--	--	311	241	241	1.0	--	--	--		293		
3-12-52				3.64	2.22	11.17			5.10	5.02	6.80	0.02							
				21	13	66			30	30	40						993		
85/ 1E- 70 4 S	--	8.0	1750	90	36	248	5	0	327	371	201	0	0.8	0.32	23	1188	373		
5- 2-63				4.49	2.96	10.78	0.13		5.36	7.72	5.67								
				24	16	59	1		29	41	30						1136		
85/ 1E-17A 2 S	--	7.9	750	26	5	114	5	0	132	79	105	3.8	1.2	0.32	22	435	86		
11- 2-62				1.30	0.41	4.96	0.13		2.16	1.64	2.96	0.06							
				19	6	73	2		32	24	43	1					426		
85/ 1E-17E 2 S	67	7.7	1481	64	23	220	6	0	303	183	205	3.4	0.9	0.24	25	880	254		
11- 2-62				3.19	1.89	9.57	0.15		4.97	3.81	5.78	0.05							
				22	13	65	1		34	26	40						879		
85/ 1E-18C 1 S	69	7.9	1575	61	10	251	2	0	234	194	244	11	0.7	0.35	25	930	193		
11- 2-62				3.04	0.82	10.91	0.05		3.84	4.04	6.88	0.18							
				21	6	74			26	27	46	1					914		
85/ 1E-18H 1 S	72	7.9	1570	64	29	228	5	0	320	208	216	3.6	0.9	0.26	24	940	279		
11- 2-62				3.19	2.38	9.91	0.13		5.24	4.33	6.09	0.06							
				20	15	63	1		33	28	39						936		
85/ 1E-18K 1 S	--	8.8	1370	8	1	336	--	--	244	188	256	1	--	0.16	--		24		
11-16-51				0.40	0.08	14.61			4.00	3.91	7.22	0.02							
				3	1	97			26	26	48						910		
85/ 1E-18K 2 S	--	8.2	1337	18	4	240	1	0	198	157	194	3.6	0.7	0.20	16	770	62		
11- 2-62				0.90	0.33	10.44	0.03		3.25	3.27	5.47	0.06							
				8	3	89			27	27	45						732		
85/ 1W-12K 1 S	--	7.5	1810	90	29	275	6	0	321	313	263	2.0	0.6	0.33	24	1112	344		
8-21-63				4.49	2.38	11.96	0.15		5.26	6.52	7.42	0.03							
				24	13	63	1		27	34	39						1161		
ANZA HYDRO SUBUNIT				Z02G0															
75/ 2E-130 1 S	--	7.3	538	59	9	34	5	0	128	25	34	105	0.2	0.02	35	383	184		
5- 1-63				2.94	0.74	1.48	0.13		2.10	0.52	0.96	1.69							
				56	14	28	2		40	10	18	32					369		
75/ 2E-130 2 S	--	7.7	210	23	5	19	--	--	85	10	7	29	--	0	--		78		
11-21-51				1.15	0.41	0.83			1.39	0.21	0.20	0.47							
				48	17	35			61	9	9	21					135		
75/ 2E-22K 1 S	65	8.4	300	16	2	43	3	5	98	19	29	0.5	0.3	0.06	24	180	48		
11- 2-62				0.80	0.16	1.87	0.08	0.17	1.61	0.40	0.82	0.01							
				27	5	64	3	6	53	13	27						190		
75/ 2E-268 1 S	--	7.7	330	32	7	21	4	0	113	14	31	5.0	0.1	0.12	29		109		
5- 1-62				1.60	0.58	0.91	0.10		1.85	0.29	0.87	0.08							
				50	18	29	3		60	9	28	3					188		
																	199		
75/ 2E-32A 2 S	63	7.9	381	28	7	40	1	0	127	23	32	13	0.4	0.06	32	230	99		
11- 2-62				1.40	0.58	1.74	0.03		2.08	0.48	0.90	0.21							
				37	15	46	1		57	13	25	6					239		
75/ 2E-32F 1 S	--	7.9	1163	66	20	171	6	--	232	182	160	3.0	0.5	0.15	--		247		
12- 9-53				3.29	1.64	7.44	0.15		3.80	3.79	4.51	0.05							
				26	13	59	1		31	31	37						724		
																	723		
75/ 2E-32J 1 S	64	8.0	354	14	1	57	3	0	90	16	55	1.0	0.3	0.04	17	295	39		
11- 2-62				0.70	0.08	2.48	0.08		1.48	0.33	1.55	0.02							
				21	2	74	2		44	10	46	1					209		
75/ 2E-33C 1 S	65	7.6	637	48	10	70	4	0	211	31	76	4.3	0.3	0	--	376	161		
9-13-55				2.40	0.82	3.04	0.10		3.46	0.65	2.14	0.07							
				38	13	48	2		55	10	34	1					347		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C 105°C Computed	Total hardness as CaCO ₃		
ANZA HYORO SUBUNIT				SANTA MARGARITA HYORO UNIT										20200					
				20260															
7S/ 3E- 7R 1 S 9- 2-54	71	7.1	1217	162 8.08 63	36 2.96 23	35 1.52 12	10 0.26 2	--	104 1.70 14	307 6.39 52	135 3.81 31	23.4 0.38 3	0.1	0.02	--			969 760	552
7S/ 3E- 8Q 2 S 10-31-62	68	7.6	782	83 4.14 51	21 1.73 21	47 2.04 25	6 0.15 2	0	232 3.80 47	128 2.66 33	56 1.58 19	7.4 0.12 1	0.5	0.02	31			500 494	294
7S/ 3E-10L 1 S 11- 1-62	--	7.6	773	80 3.99 49	20 1.64 20	55 2.39 29	4 0.10 1	0	332 5.44 67	39 0.81 10	65 1.83 23	1.0 0.02	0.4	0.02	30			450 458	282
7S/ 3E-14C 1 S 11- 1-62	--	7.8	1008	98 4.89 49	20 1.64 17	74 3.22 33	6 0.15 2	0	320 5.24 53	161 3.35 34	43 1.21 12	4.5 0.07 1	0.8	0.04	29			595 594	327
7S/ 3E-15P 1 S 11- 1-62	--	8.1	672	58 2.89 42	12 0.99 14	68 2.96 43	3 0.08 1	0	234 3.84 56	61 1.27 19	60 1.69 25	3.0 0.05 1	0.8	0.02	25			405 406	194
7S/ 3E-16P 1 S 10-31-62	64	7.0	509	27 1.35 28	14 1.15 24	48 2.09 44	6 0.15 3	0	66 1.08 25	77 1.60 37	53 1.49 35	7.0 0.11 3	0.6	0.02	57			350 322	125
7S/ 3E-17B 2 S 10-31-62	66	8.1	797	82 4.09 49	19 1.56 19	60 2.61 31	3 0.08 1	0	278 4.56 53	91 1.89 22	54 1.52 18	40 0.65 8	0.5	0.02	29			490 515	283
7S/ 3E-17C 1 S 5-21-53	--	7.6	790	60 2.99 38	23 1.89 24	68 2.96 38	--	--	208 3.41 47	89 1.85 25	60 1.69 23	23 0.37 5	--	0.10	--			244 425	
7S/ 3E-20A 1 S 5-23-56	67	7.6	898	72 3.59 40	23 1.89 21	77 3.35 37	5 0.13 1	0	162 2.66 30	162 3.37 38	96 2.71 30	14 0.23 3	0.2	0.15	--			613 529	274
7S/ 3E-20B 1 S 9- 2-54	62	7.1	748	76 3.79 50	20 1.64 21	47 2.04 27	7 0.18 2	--	229 3.75 50	82 1.71 23	64 1.80 24	12.5 0.20 3	0.5	0.12	--			480 422	272
7S/ 3E-20C 1 S 9- 3-54	--	7.3	610	74 3.69 58	8 0.66 10	42 1.83 29	5 0.13 2	--	235 3.85 60	16 0.33 5	71 2.00 31	18.2 0.29 4	0	0.11	--			394 350	218
7S/ 3E-20C 2 S 10-19-54	--	7.8	810	81 4.04 52	17 1.40 18	50 2.17 28	8 0.20 3	0	96 1.57 20	184 3.83 49	83 2.34 30	5.0 0.08 1	0.2	0	--			557 475	272
7S/ 3E-20D 2 S 10-31-62	64	7.4	451	40 2.00 47	7 0.58 14	35 1.52 36	5 0.13 3	0	173 2.84 65	10 0.21 5	38 1.07 24	16 0.26 6	0.3	0.06	37			300 273	129
7S/ 3E-20E 2 S 10-31-62	63	7.6	508	51 2.54 51	11 0.90 18	32 1.39 28	7 0.18 4	0	188 3.08 60	7 0.15 3	50 1.41 27	32 0.52 10	0.2	0.04	24			310 307	172
7S/ 3E-20G 1 S 10-31-62	65	7.8	580	54 2.69 47	14 1.15 20	40 1.74 30	7 0.18 3	0	139 2.28 39	110 2.29 39	42 1.18 20	4.0 0.06 1	0.4	0	18			360 358	192
7S/ 3E-20H 1 S 9- 2-54	--	7.3	572	60 2.99 52	12 0.99 17	37 1.61 28	6 0.15 3	--	149 2.44 43	102 2.12 37	39 1.10 19	2.3 0.04 1	0.5	0.12	--			369 332	199
7S/ 3E-20J 1 S 5- 1-62	--	7.2	715	74 3.69 50	16 1.32 18	51 2.22 30	5 0.13 2	0	146 2.39 33	136 2.83 39	65 1.83 25	11 0.18 2	0.3	0.10	32			502 462	251
7S/ 3E-20J 2 S 9- 2-54	--	7.1	748	80 3.99 54	14 1.15 16	48 2.09 28	6 0.15 2	--	159 2.61 35	131 2.73 36	67 1.89 25	15.3 0.25 3	0.1	0.15	--			504 440	257
7S/ 3E-20J 3 S 10-31-62	--	7.4	716	60 2.99 43	14 1.15 17	60 2.61 38	6 0.15 2	0	122 2.00 29	138 2.87 41	74 2.09 30	2.4 0.04 1	0.5	0	28			460 443	207
7S/ 3E-21G 1 S 6- 5-57	66	7.8	855	59 2.94 36	17 1.40 17	84 3.65 45	4 0.10 1	0	183 3.00 36	130 2.71 33	88 2.48 30	6.6 0.11 1	0.5	0.18	27			550 506	217
7S/ 3E-21K 1 S 11-29-51	--	8.0	760	58 2.89 38	17 1.40 18	78 3.39 44	--	--	183 3.00 40	110 2.29 30	71 2.00 27	15 0.24 3	--	0	--			215 439	
7S/ 3E-21K 3 S 11- 1-62	--	7.4	747	61 3.04 41	17 1.40 19	68 2.96 39	4 0.10 1	0	193 3.16 42	98 2.04 27	66 1.86 25	24 0.39 5	0.4	0.02	35			475 468	222
7S/ 3E-21L 1 S 5-27-53	--	7.6	750	66 3.29 41	20 1.64 21	70 3.04 38	--	--	213 3.49 45	96 2.00 26	67 1.89 24	21 0.34 4	--	0.08	--			247 445	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap. 180°C Computed	Total hardness as CaCO ₃	
Date sampled																		

ANZA HYDRO SUBUNIT

202G0

SANTA MARGARITA HYDRO UNIT

20200

75/ 3E-21P 1 5	64	7.2	793	53	10	92	5	0	107	167	83	4.0	0.4	0.06	8	485	173
11- 1-62				2.64	0.82	4.00	0.13		1.75	3.48	2.34	0.06					
				35	11	53	2		23	46	31	1				475	
75/ 3E-22B 5 5	64	7.3	1410	150	41	110	4	0	232	485	54	13	0.9	0.08	29	1030	543
11- 1-62				7.49	3.37	4.78	0.10		3.80	10.10	1.52	0.21					
				48	21	30	1		24	65	10	1				1001	
75/ 3E-22D 1 5	60	7.8	1340	137	32	103	7	0	301	113	218	21	0.3	0.12	36		474
5- 1-62				6.84	2.63	4.48	0.18		4.93	2.35	6.15	0.34				1000	
				48	19	32	1		36	17	45	2				815	
75/ 3E-22D 7 5	--	7.5	717	71	14	55	7	0	193	100	70	2.0	0.4	0.04	35	465	235
11- 1-62				3.54	1.15	2.39	0.18		3.16	2.08	1.97	0.03					
				49	16	33	2		44	29	27					449	
75/ 3E-23D 1 5	--	8.3	994	82	26	90	6	19	290	39	115	49	0.6	0.04	30	600	312
11- 1-62				4.09	2.14	3.91	0.15	0.63	4.75	0.81	3.24	0.79					
				40	21	38	1	6	46	8	32	8				599	
75/ 3E-23R 2 5	--	8.2	1039	72	28	123	5	0	397	45	98	76	0.4	0.15	21	658	295
11-22-57				3.59	2.30	5.35	0.13		6.51	0.94	2.76	1.23				664	
				32	20	47	1		57	8	24	11					
75/ 3E-27M 1 5	--	8.3	790	86	22	83	--	--	140	240	82	2.0	--	0.17	--		305
11-20-51				4.29	1.81	3.61			2.29	5.00	2.31	0.03					
				44	19	37			24	52	24					584	
85/ 2E- 5A 1 5	63	8.1	415	15	3	63	4	0	81	13	75	3.0	0.3	0.02	24	230	50
11- 2-62				0.75	0.25	2.74	0.10		1.33	0.27	2.12	0.05					
				20	7	71	3		35	7	56	1				240	
85/ 2E- 5C 1 5	65	7.6	363	21	7	38	5	0	105	7	52	1.0	0.4	0.02	45	210	82
11- 2-62				1.05	0.58	1.65	0.13		1.72	0.15	1.47	0.02					
				31	17	48	4		51	4	44	1				228	
85/ 3E- 8C 1 5	67	8.3	240	22	6	--	--	--	110	2	12	23	--	0.08	--		80
11-21-51				1.10	0.49				1.80	0.04	0.34	0.37					

AGUANGA HYDRO SUBUNIT

202H0

85/ 1E- 7N 1 5	--	7.6	1620	71	28	259	8	0	317	226	236	1.6	1.0	0.37	--		292
9-13-55				3.54	2.30	11.26	0.20		5.20	4.71	6.66	0.03					
				20	13	65	1		31	26	40					987	
85/ 1E-19F 1 5	--	7.7	2450	298	10	201	4	--	168	97	706	8.1	0.4	0.10	--	1805	785
11-12-53				14.87	0.82	8.74	0.10		2.75	2.02	19.91	0.13				1407	
				61	3	36			11	8	80	1					
85/ 1E-19F 3 5	--	8.0	1180	155	9	69	--	--	177	27	277	12	--	0.14	--		424
11-16-50				7.73	0.74	3.00			2.90	0.56	7.81	0.19				636	
				67	6	26			25	5	68	2					
85/ 1E-19H 1 5	--	8.1	1460	159	12	140	--	--	140	118	359	4.8	--	0.30	--		446
11-16-50				7.93	0.99	6.09			2.29	2.46	10.12	0.08				862	
				53	7	41			15	16	68	1					
85/ 1E-19H 2 5	72	7.6	1438	102	8	171	3	0	132	106	315	3.1	0.9	0.61	19	859	288
11- 1-62				5.09	0.66	7.44	0.08		2.16	2.21	8.88	0.05				794	
				38	5	56	1		16	17	67						
85/ 1E-19H 3 5	--	7.5	3220	363	29	--	--	--	146	124	975	13	--	0.45	--		1025
1-16-51				18.11	2.38				2.39	2.58	27.50	0.21					
85/ 1E-19H 4 5	--	8.4	848	18	4	175	2	--	122	76	174	2.0	0.9	0.42	--		62
11-12-53				0.90	0.33	7.61	0.05		2.00	1.58	4.91	0.03				530	
				10	4	86	1		23	19	58					512	
85/ 1E-19J 1 5	--	7.9	2300	304	25	175	--	--	232	254	560	5.3	--	0.09	--		862
11-16-50				15.17	2.06	7.61			3.80	5.29	15.79	0.09				1437	
				61	8	31			15	21	63						
85/ 1E-19K 1 5	--	7.5	1370	159	31	139	--	--	482	276	103	3.7	--	0.17	--		524
11-17-50				7.93	2.55	6.04			7.90	5.75	2.90	0.06					
				48	15	37			48	35	17					949	
85/ 1E-19K 3 5	--	7.2	1704	169	41	156	2	0	432	304	184	6.0	0.7	0.20	48	1145	590
11- 1-62				8.43	3.37	6.78	0.05		7.08	6.33	5.19	0.10				1123	
				45	18	36			38	34	28	1					
85/ 1E-19O 1 5	--	8.3	1440	133	34	175	--	--	403	269	160	2.4	--	0.32	--		472
11-19-51				6.64	2.80	7.61			6.61	5.60	4.51	0.04				972	
				39	16	45			39	33	27						
85/ 1E-19O 2 5	--	7.6	1204	93	23	130	4	0	301	224	107	0	0.3	0	31	865	327
4-27-62				4.64	1.89	5.65	0.10		4.93	4.66	3.02						
				38	15	46	1		39	37	24					760	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million						
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃		
Date sampled																			
AGUANGA HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT														20200	
				Z02H0															
8S/ 1E-20M 1 S 11-16-50	--	8.1	710	41 2.05 27	6 0.49 6	118 5.13 67	--	--	171 2.80 37	78 1.62 22	106 2.99 40	3.6 0.06 1	--	0.58	--		127 437		
8S/ 1E-20M 2 S 11-16-50	--	8.3	530	11 0.55 10	1 0.08 1	114 4.96 89	--	--	134 2.20 40	34 0.71 13	89 2.51 46	2.4 0.04 1	--	0.61	--		32 318		
8S/ 1E-20M 3 S 10-31-62	--	7.9	729	27 1.35 20	2 0.16 2	120 5.22 78	0	0	144 2.36 35	75 1.56 23	101 2.85 42	0.5 0.01	1.2	0.56	44	455 442	76		
8S/ 1E-20P 2 S 4-15-54	--	9.4	362	3 0.15 4	1 0.08 2	93 4.04 95	0	7 0.23 5	118 1.93 45	15 0.31 7	64 1.80 42	1.5 0.02	1.8	0.72	--	269 245	12		
8S/ 1E-20R 1 S 11- 1-62	--	8.1	454	4 0.20 5	0	94 4.09 95	1 0.03 1	0	129 2.11 49	12 0.25 6	67 1.89 43	6.0 0.10 2	0.5	0.34	22	270 270	10		
8S/ 1E-26M 3 S 12-18-62	--	7.5	880	82 4.09 43	18 1.48 16	90 3.91 41	2 0.05 1	0	272 4.46 48	133 2.77 30	73 2.06 22	0	0.4	0.18	26	540 558	279		
8S/ 1E-270 1 S 11-19-58	--	7.6	921	73 3.64 40	10 0.82 9	105 4.57 50	2 0.05 1	0	245 4.02 43	103 2.14 23	108 3.05 33	5 0.08 1	0.7	0.16	32	648 559	223		
8S/ 1E-280 1 S 11- 2-62	--	7.6	909	54 2.69 31	4 0.33 4	128 5.57 65	1 0.03	0	138 2.26 26	193 4.02 46	84 2.37 27	2.2 0.04	0.7	0.45	25	558 560	151		
8S/ 1E-29J 1 S 3-25-52	--	7.4	300	25 1.25 38	13 1.07 32	23 1.00 30	--	--	165 2.70 83	1 0.02 1	18 0.51 16	1.5 0.02 1	--	0.08	--		116 163		
8S/ 1E-29Q 2 S 11- 1-62	--	8.1	1264	9 0.45 4	3 0.25 2	270 11.74 94	1 0.03	0	351 5.75 45	200 4.16 32	103 2.90 23	2.0 0.03	0.7	0.22	16	760 717	35		
8S/ 1E-33F 1 S 11- 2-62	--	7.9	754	88 4.39 54	20 1.64 20	45 1.96 24	3 0.08 1	0	198 3.25 40	185 3.85 48	32 0.90 11	2.5 0.04	0.4	0.04	32	520 505	302		
8S/ 1E-33G 1 S 8-21-62	72	7.4	940	109 5.44 54	22 1.81 18	61 2.65 26	5 0.13 1	0	331 5.43 45	253 5.27 43	50 1.41 12	2.0 0.03	0.4	0.05	24	636 689	363		
8S/ 1E-34P 1 S 11- 2-62	--	7.4	725	75 3.74 51	13 1.07 15	56 2.43 33	4 0.10 1	0	211 3.46 48	96 2.00 28	61 1.72 24	3.4 0.05 1	0.6	0.07	31	431 444	241		
8S/ 1E-36N 1 S 6-11-64	66	8.3	520	38 1.90 35	11 0.90 16	61 2.65 48	2 0.05 1	6 0.20 4	165 2.70 51	14 0.29 5	61 1.72 33	23 0.37 7	0.6	0.24	--	322 298	140		
8S/ 1W-13K 1 S 11-27-51	--	7.9	1130	44 2.20	50 4.11	--	--	--	409 6.70	1 0.02	170 4.79	1 0.02	--	2.72	--		316		
8S/ 1W-13P 1 S 12-20-62	--	7.4	1330	116 5.79 41	36 2.96 21	118 5.13 37	5 0.13 1	0	293 4.80 34	279 5.81 42	115 3.24 23	5.0 0.08 1	0.4	0.30	26	816 845	438		
8S/ 1W-130 1 S 12-20-62	--	8.1	1310	61 3.04 22	68 5.59 41	113 4.91 36	5 0.13 1	0	290 4.75 35	271 5.64 41	114 3.21 23	5.0 0.08 1	0.4	0.27	26	862 806	432		
8S/ 1W-22G 1 S 12-20-62	--	7.5	735	80 3.99 53	13 1.07 14	55 2.39 32	3 0.08 1	0	265 4.34 58	86 1.79 24	48 1.35 18	0	0.2	0.10	29	424 445	253		
8S/ 1W-22K 1 S 8-21-62	66	7.0	625	58 2.89 42	16 1.32 19	58 2.52 37	3 0.08 1	0	235 3.85 57	76 1.58 23	47 1.33 20	0	0.4	0.08	32	388 406	211		
8S/ 1W-250 1 S 10-30-62	--	7.8	1007	91 4.54 41	50 4.11 37	56 2.43 22	2 0.05	0	359 5.88 53	135 2.81 25	73 2.06 19	19 0.31 3	0.6	0.06	47	660 650	433		
8S/ 1W-360 1 S 10-30-62	--	8.9	267	6 0.30 11	1 0.08 3	51 2.22 84	2 0.05 2	16 0.53 21	78 1.28 51	14 0.29 12	14 0.39 16	1.1 0.02 1	1.7	0.52	33	140 179	19		
9S/ 1W- 1FS1 S 10-30-62	--	7.9	492	58 02.89 56	8 060.66 13	35 1.52 30	3 0.08 2	0 3 3	244 64.00 77	18 0.37 7	28 0.79 15	0.5 0.01	0.5	0.06	45	300 316	178		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃	
Date sampled																		

OAKGROVE HYDRO SUBUNIT				SANTA MARGARITA HYDRO UNIT										20200					
20210																			
9S/ 1E- 10 1 S	--	8.5	550	8	1	112	3	6	109	75	66	0	0.4	0.33	26	356	24		
12-18-62				0.40	0.08	4.87	0.08	0.20	1.79	1.56	1.86								
				7	1	90	1	4	33	29	34					351			
9S/ 1E-12A 1 S	--	7.5	1220	119	33	122	6	0	378	261	85	6.0	0.2	0.10	28	872	433		
8-21-62				5.94	2.71	5.30	0.15		6.20	5.43	2.40	0.10							
				42	19	38	1		44	38	17	1				846			
9S/ 2E- 7G 1 S	--	8.0	610	53	10	61	3	0	254	11	59	2.1	0.4	0.05	28	346	173		
10-14-61				2.64	0.82	2.65	0.08		4.16	0.23	1.66	0.03							
				43	13	43	1		68	4	27					352			
9S/ 2E- 8Q 2 S	--	7.4	345	32	6	31	2	0	121	11	22	36	0.2	0.10	28	238	105		
12-19-62				1.60	0.49	1.35	0.05		1.98	0.23	0.62	0.58							
				46	14	39	1		58	7	18	17				228			
9S/ 2E-15R 1 S	--	7.6	540	44	15	55	--	--	293	6	27	2.5	--	0	--		172		
11-30-51				2.20	1.23	2.39			4.80	0.12	0.76	0.04							
				38	21	41			84	2	13	1				294			
9S/ 2E-16N 3 S	--	8.1	532	52	12	46	2	0	260	17	30	3.0	0.2	0.08	25	296	179		
12-18-62				2.59	0.99	2.00	0.05		4.26	0.35	0.85	0.05							
				46	18	36	1		77	6	15	1				315			
9S/ 2E-17K 1 S	74	7.9	665	66	15	55	2	0	220	93	40	12	0.2	0.07	--	410	226		
7-16-64				3.29	1.23	2.39	0.05		3.61	1.94	1.13	0.19							
				47	18	34	1		53	28	16	3				391			
9S/ 2E-22J 1 S	--	7.3	480	34	18	46	3	0	232	30	28	3.0	0.2	0.07	23	304	159		
12-19-62				1.70	1.48	2.00	0.08		3.80	0.62	0.79	0.05							
				32	28	38	2		72	12	15	1				299			
9S/ 2E-27J 1 S	--	8.5	370	50	10	32	--	0	201	18	18	4.0	--	0.13	--		166		
11-21-51				2.50	0.82	1.39			3.29	0.37	0.51	0.06							
				53	17	30			78	9	12	1				231			
9S/ 3E-16A 1 S	--	7.8	560	60	15	58	--	--	305	14	39	7.1	--	--	--		211		
12- 8-50				2.99	1.23	2.52			5.00	0.29	1.10	0.11							
				44	18	37			77	4	17	2				343			
9S/ 3E-16A 2 S	--	7.1	510	48	11	45	3	0	226	7	46	0	0.2	0.05	15	260	165		
12-19-62				2.40	0.90	1.96	0.08		3.70	0.15	1.30								
				45	17	37	1		72	3	25					286			
9S/ 3E-16Q 1 S	--	7.6	655	65	23	51	1	0	346	10	48	0	0.2	0.08	35	450	257		
12-19-62				3.24	1.89	2.22	0.03		5.67	0.21	1.35								
				44	26	30			78	3	19					403			

BONSALL HYDRO SUBUNIT				203A0		SAN LUIS KEY HYDRO UNIT						20300									
10S/ 1W-3UP 1 S	72	7.2	1185	91	46	83	5	0	240	47	228	30	0.4	0.04	49	824	416				
3-17-64				4.54	3.78	3.61	0.13		3.93	0.98	6.43	0.48									
				38	31	30	1		33	8	54	4				697					
10S/ 2W-22N 1 S	--	7.3	1135	77	44	98	4	0	281	82	180	24	0.5	0.09	39	740	373				
6-17-64				3.84	3.62	4.26	0.10		4.61	1.71	5.08	0.39									
				32	31	36	1		39	15	43	3				687					
10S/ 3W- 1L 1 S	68	7.3	960	82	28	82	4	0	254	102	126	11	0.2	0.05	25	586	320				
8-22-63				4.09	2.30	3.57	0.10		4.16	2.12	3.55	0.18									
				41	23	35	1		42	21	35	2				585					
10S/ 3W- 3M 1 S	--	7.2	835	50	37	74	1	0	273	61	103	14	0.5	0.09	48	545	277				
6-17-64				2.50	3.04	3.22	0.03		4.47	1.27	2.90	0.23									
				28	35	37			50	14	33	3				523					
10S/ 3W-11G 1 S	66	8.0	1140	112	51	98	7	0	248	283	153	6.7	0.2	0.15	28	920	489				
10-25-63				5.59	4.15	4.26	0.18		4.06	5.89	4.31	0.11									
				39	29	30	1		28	41	30	1				861					
10S/ 3W-11H 1 S	--	7.4	1250	140	28	75	--	0	235	260	136	--	--	--	23	984	465				
3-26-63				6.99	2.30	3.26			3.85	5.41	3.84										
10S/ 3W-11L 2 S	69	6.9	1850	136	125	120	6	0	197	765	130	0	0.2	0.16	26	1626	854				
8-20-63				6.79	10.28	5.22	0.15		3.23	15.93	3.67										
				30	46	23	1		14	70	16					1405					
10S/ 3W-11M 1 S	--	7.8	864	66	23	77	--	0	229	72	109	1.0	--	0	--		259				
1- 9-51				3.29	1.89	3.35			3.75	1.50	3.07	0.02									
				39	22	39			45	18	37					528					
																461					
10S/ 3W-11M 2 S	--	7.1	1440	106	72	108	6	0	201	423	149	0	0.2	0.16	30	1104	561				
8-21-63				5.29	5.92	4.70	0.15		3.29	8.81	4.20										
				33	37	29	1		20	54	26					993					
10S/ 3W-12C 1 S	--	7.5	1480	122	68	130	8	0	322	346	190	0	0.2	0.18	29	1130	584				
10-25-63				6.09	5.59	5.65	0.20		5.28	7.20	5.36										
				35	32	32	1		30	40	30					1052					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

BONSALL HYORO SUBUNIT				203A0				SAN LUIS KEY HYORO UNIT				20300							
10S/ 3W-12F 1 S	69	7.1	1635	120	45	170	5	0	396	229	207	16	0.4	0.36	27	1165	485		
4-26-62				5.99	3.70	7.39	0.13		6.49	4.77	5.84	0.26							
				35	21	43	1		37	27	34	1				1014			
10S/ 3W-15A 1 S	--	7.8	1600	169	71	128	7	0	200	532	201	0	0.6	0.34	--		714		
7- 1-55				8.43	5.84	5.57	0.18		3.28	11.08	5.67					1375			
				42	29	28	1		16	55	28					1207			
10S/ 3W-15B 1 S	68	7.8	1222	123	47	74	7	0	199	432	83	0	0.2	0.13	25		501		
7-13-61				6.14	3.87	3.22	0.18		3.26	8.99	2.34					1034			
				46	29	24	1		22	62	16					889			
10S/ 3W-15B 2 S	66	6.6	1335	134	43	94	7	0	168	432	103	2.5	0.1	0.07	--		512		
6-29-56				6.69	3.54	4.09	0.18		2.75	8.99	2.90	0.04				980			
				46	24	28	1		19	61	20					898			
10S/ 3W-15F 1 S	--	7.3	1402	147	39	132	6	0	264	303	190	0	0.4	0.24	--		528		
7- 1-55				7.34	3.21	5.74	0.15		4.33	6.31	5.36					1060			
				45	20	35	1		27	39	34					947			
10S/ 3W-16B 1 S	--	7.2	929	62	40	82	3	0	273	72	141	7.9	0.4	0.04	--		319		
8-24-54				3.19	3.29	3.57	0.08		4.47	1.50	3.98	0.13				595			
				31	33	36	1		44	15	39	1				543			
10S/ 3W-16C 1 S	68	7.2	1382	86	63	117	3	0	201	304	167	7	0.6	0.16	35	960	474		
4-26-62				4.29	5.18	5.09	0.08		3.29	6.33	4.71	0.11				882			
				29	35	35	1		23	44	33	1							
10S/ 3W-16E 4 S	69	6.5	1420	153	62	79	5	0	82	576	107	5.6	0.2	0.13	37	1140	637		
8-20-63				7.63	5.10	3.43	0.13		1.34	11.99	3.02	0.09				1065			
				47	31	21	1		8	73	18	1							
10S/ 3W-16F 8 S	66	7.2	2200	238	158	160	7	0	177	1124	191	3.6	0.2	0.25	31	2162	1244		
10-25-63				11.88	12.99	6.96	0.18		2.90	23.40	5.39	0.06				2000			
				37	41	22	1		9	74	17								
10S/ 3W-16F 9 S	69	6.9	1980	265	92	80	7	0	113	969	81	0	0.5	0.21	30		1040		
11-16-60				13.22	7.57	3.48	0.18		1.85	20.17	2.28					1696			
				54	31	14	1		8	83	9					1580			
10S/ 3W-16F10 S	70	7.2	2152	217	106	124	6	0	231	790	173	4.0	0.5	0.29	29		978		
11-16-60				10.83	8.72	5.39	0.15		3.79	16.45	4.88	0.06				1668			
				43	35	21	1		15	65	19					1563			
10S/ 3W-16J 4 S	69	7.4	1830	156	61	175	6	0	300	427	231	0	0.2	0.19	25	1106	641		
8-20-63				7.78	5.02	7.61	0.15		4.92	8.89	6.51					1229			
				38	24	37	1		24	44	32								
10S/ 3W-20A 2 S	69	7.2	1950	145	96	160	7	0	264	538	221	34	0.2	0.21	32	1470	758		
8-20-63				7.24	7.90	6.96	0.18		4.33	11.20	6.23	0.55				1363			
				32	35	31	1		19	50	28	2							
10S/ 3W-200 1 S	73	7.4	680	40	18	79	3	0	170	33	99	35	0.2	0.11	34	408	174		
8-20-63				2.00	1.48	3.43	0.08		2.79	0.69	2.79	0.56				425			
				29	21	49	1		41	10	41	8							
10S/ 3W-20E 1 S	65	7.5	1660	128	57	164	5	0	342	363	195	0	0.6	0.19	24		554		
11- 3-60				6.39	4.64	7.13	0.13		5.61	7.56	5.50					1126			
				35	26	39	1		30	40	29					1105			
10S/ 3W-20P 3 S	--	7.5	2150	249	41	300	4	0	491	532	363	0	0.4	0.20	28	1820	791		
10-25-63				12.43	3.37	13.04	0.10		8.05	11.08	10.24					1759			
				43	12	45			27	38	35								
10S/ 3W-20P 4 S	--	8.4	--	118	78	302	6	16	361	430	332	0	0.4	--	--		615		
1- 3-61				5.89	6.41	13.13	0.15	0.53	5.92	8.95	9.36					1460			
				23	25	51	1	2	24	36	38								
10S/ 3W-29C 1 S	--	7.7	4000	235	137	428	4	0	503	284	945	37	0.2	0.32	29	2708	1151		
7-20-63				11.73	11.27	18.61	0.10		8.24	5.91	26.65	0.60				2347			
				28	27	45			20	14	64	1							
10S/ 3W-29C 2 S	69	7.1	2453	164	57	248	6	0	5	229	475	0	0.3	0.04	29	1684	644		
8- 3-59				8.18	4.64	10.78	0.15		0.08	4.77	13.40					1211			
				34	20	45	1			26	73								
10S/ 3W-29E 1 S	--	7.6	2235	174	70	210	9	0	421	392	304	0	0.6	0.36	26		723		
11- 3-60				8.68	5.76	9.13	0.23		6.90	8.16	8.57					1470			
				36	24	38	1		29	35	36					1393			
10S/ 3W-31F 2 S	70	6.8	1754	--	--	--	--	--	188	--	306	--	--	--	--		646		
6-28-56									3.08		8.63								
10S/ 3W-31F 3 S	--	7.0	1950	118	61	186	7	0	225	280	351	0	0.6	0.17	24	1206	546		
6-25-57				5.89	5.02	8.09	0.18		3.69	5.83	9.90					1138			
				31	26	42	1		19	30	51								

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	Evap 180°C Computed	Evap 105°C	Total hardness as CaCO ₃

BONSALL HYDRO SUBUNIT				SAN LUIS KEY HYDRO UNIT										Z0300				
105/ 3W-31P 1 S 4-26-62	--	7.5	2080	251 12.52 56	10 0.82 4	200 8.70 39	10 0.26 1	0	57 0.93 4	590 12.28 56	310 6.74 40	0	1.0	0		1440 1409	668	
105/ 3W-32R 1 S 11-13-62	--	7.1	1280	92 4.59	41 3.37	113 4.91	--	0	259 4.25	93 1.94	221 6.23	--	--	0.40	41	820	518	
105/ 3W-36N 1 S 10-16-62	--	7.2	2030	154 7.68	52 4.28	187 8.13	--	0	378 6.20	206 4.29	342 9.64	--	--	0.20	46	1496	578	
105/ 4W- 1R 1 S 6-17-64	--	7.2	1037	59 2.94 26	51 4.19 38	90 3.91 35	4 0.10 1	0	159 2.61 24	209 4.35 40	141 3.69 34	20 0.32 3	0.3	0.08	55	780 697	357	
105/ 4W-27J 1 S 2-10-60	--	7.7	1050	49 2.45 24	38 3.13 30	103 4.48 43	11 0.28 3	0	201 3.29 33	27 0.56 6	209 5.69 59	15 0.24 2	0.5	0.04	31	589 582	279	
105/ 4W-33G 1 S 9-27-63	--	7.8	1174	69 3.44 30	34 2.80 24	115 5.00 43	10 0.26 2	0	210 3.44 30	45 0.94 8	253 7.13 62	4.1 0.07 1	0.5	0.31	29	740 663	311	
105/ 4W-33M 1 S 10- 5-61	70	7.9	1718	41 2.05 12	32 2.63 15	285 12.39 72	2 0.05	0	325 5.33 32	83 1.73 10	349 9.84 58	1.0 0.02	0.8	0.24	28	935 982	234	
105/ 4W-35N 1 S 10-15-63	--	7.5	930	55 2.74 29	26 2.14 23	98 4.26 46	8 0.20 2	0	202 3.31 36	32 0.67 7	179 5.05 55	7.5 0.12 1	0.2	0.15	25	638 530	244	
105/ 4W-35P 1 S 10-15-63	--	7.9	980	39 1.95 20	12 0.99 10	160 6.96 70	3 0.08 1	0	198 3.25 33	36 0.75 8	204 5.75 59	0	0.1	0.33	25	560 577	147	
105/ 4W-35R 1 S 12- 5-56	66	7.6	1560	100 4.99 31	57 4.69 29	149 6.48 40	6 0.15 1	0	253 4.15 26	156 3.25 20	310 8.74 54	0	0.5	0.01	47	1050 950	484	
105/ 4W-35R 2 S 10- 5-61	71	7.4	1650	136 6.79 34	60 4.93 25	180 7.83 40	8 0.20 1	0	221 3.62 18	288 6.00 30	360 10.15 51	1.3 0.02	0.1	0.17	11	1312 1153	586	
105/ 4W-35R 3 S 10-15-63	70	7.0	1930	181 9.03 43	52 4.28 20	177 7.70 36	9 0.23 1	0	220 3.61 17	331 6.89 32	376 10.66 50	5.3 0.09	0.2	0.21	20	1482 1262	666	
115/ 1W- 7L 1 S 6-17-64	72	8.2	450	27 1.35 28	10 0.82 17	59 2.57 54	2 0.05 1	0	191 3.13 66	16 0.33 7	40 1.13 24	10 0.16 3	0.2	0.07	--	296 258	109	
115/ 1W- 7P 1 S 6-17-64	70	7.4	585	38 1.90 32	20 1.64 27	54 2.35 39	3 0.08 1	0	205 3.36 56	40 0.83 14	53 1.49 25	20 0.32 5	0.2	0.10	--	368 329	177	
115/ 1W-168 2 S 6-17-64	70	7.9	495	33 1.65 32	12 0.99 19	56 2.43 47	2 0.05 1	0	189 3.10 61	17 0.35 7	49 1.38 27	18 0.29 6	0.2	0.10	--	310 280	132	
115/ 1W-22E 1 S 6-17-64	66	8.1	730	41 2.05 28	25 2.06 28	74 3.22 44	2 0.05 1	--	239 3.92 53	43 0.90 12	73 2.06 28	31 0.50 7	0.2	0.10	--	438 407	206	
115/ 1W-22E 2 S 6-17-64	70	8.3	600	33 1.65 27	19 1.56 25	67 2.91 47	2 0.05 1	5	220 3.61 57	33 0.69 11	53 1.49 24	21 0.34 5	0.2	0.10	--	354 341	161	
115/ 2W-13R 1 S 6-17-64	--	7.5	1451	84 4.19 27	60 4.93 32	140 6.09 40	2 0.05	0	388 6.36 41	75 1.56 10	246 6.94 45	36 0.58 4	0.5	0.04	43	920 877	456	
115/ 4W- 1L 1 S 2-11-60	66	7.3	2049	115 5.74 27	88 7.24 34	184 8.00 38	6 0.20 1	0	410 6.72 32	156 3.29 16	384 10.83 51	19 0.31 1	0.4	0.31	39	1285 1197	650	
115/ 4W- 1L 2 S 2-11-60	66	7.8	2317	118 5.89 25	98 8.06 34	227 9.87 41	5 0.13 1	--	405 6.64 28	242 5.04 21	427 12.04 50	10 0.16 1	0.5	0.21	45	1456 1372	698	
115/ 4W- 2D 1 S 11-30-62	66	7.5	2300	185 9.23 39	74 6.09 26	185 8.04 34	6 0.15 1	0	317 5.20 22	224 4.66 20	474 13.37 57	5 0.08	0.2	0.25	20	1462 1329	767	
115/ 4W- 2D 2 S 9-25-61	73	7.5	1770	138 6.89 37	52 4.28 23	170 7.39 39	8 0.20 1	0	314 5.15 27	192 4.00 21	340 9.59 51	3.8 0.06	0.4	0.17	12	1196 1071	559	
115/ 4W- 20 5 S 6-27-58	--	--	808	--	--	--	--	--	--	--	103 2.90	--	--	--	--			

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
BONSALL HYDRO SUBUNIT				SAN LUIS REY HYDRO UNIT										20300				
203A0																		
115/ 4W- 20 6 5 7- 0-58	--	--	1180	--	--	--	--	--	--	--	146 4.12	--	--	--	--			
115/ 4W- 2G 1 5 10- 8-59	72	7.6	3257	184 9.18 27	136 11.18 33	312 13.57 40	3	0	386 6.33 19	182 3.79 11	815 22.98 69	3.5 0.06	0.8	0.12	40	2390 1866	1019	
115/ 4W- 2G 2 5 6-27-58	--	--	3218	--	--	--	--	--	--	--	817 23.04	--	--	--	--			
115/ 4W- 2G 4 5 9-25-61	70	7.2	2864	213 10.63 36	73 6.00 20	305 13.26 44	1	0	432 7.08 24	187 3.89 13	650 18.33 62	3.7 0.06	0.4	0.20	17	1665 1663	832	
115/ 4W- 2K 1 5 10- 2-61	69	6.8	3750	259 12.92 32	163 13.41 34	310 13.48 34	1	0	452 7.41 19	262 5.45 14	913 25.75 67	2.3 0.04	0.1	0.30	38	1778 2171	1318	
115/ 4W- 2K 2 5 9-25-61	70	7.1	2700	138 6.89 25	92 7.57 27	305 13.26 48	1	0	431 7.06 26	223 4.64 17	562 15.85 57	1.0 0.02	0.1	0.30	46	1710 1580	724	
115/ 4W- 2L 1 5 10-15-63	67	6.9	3550	271 13.52 33	141 11.60 29	350 15.22 38	4	0	360 5.90 15	209 4.35 11	1060 29.89 74	3.1 0.05	0.2	0.30	44	2614 2260	1257	
115/ 4W- 3C 1 5 10- 8-59	--	8.2	1900	131 6.54 33	65 5.35 27	175 7.61 39	7	17	329 5.39 28	130 2.71 14	376 10.60 55	2.5 0.04	0.3	0.18	20	1190 1086	595	
115/ 4W- 3C 2 5 10-15-63	72	7.4	1920	227 11.33 55	3 0.25 1	200 8.70 43	7	0	231 3.79 20	71 1.48 8	489 13.79 72	4.0 0.06	0.2	0.27	21	1438 1136	579	
115/ 4W- 3G 2 5 10-28-58	65	7.3	1172	92 4.59 37	38 3.13 25	105 4.57 37	5	--	229 3.75 30	142 2.96 24	203 5.72 46	6.0 0.10 1	0.6	0.06	30	755 734	386	
115/ 4W- 3H 3 5 10-15-63	67	7.4	2330	286 14.27 56	28 2.30 9	200 8.70 34	8	0	314 5.15 21	240 5.00 20	525 14.81 59	4.9 0.08	0.2	0.18	20	1702 1467	829	
115/ 4W- 3H 4 5 10-15-63	68	7.3	6250	381 19.01 26	198 16.28 22	850 36.96 51	15	0	386 6.33 9	585 12.18 17	1865 52.59 74	0	0.1	0.46	25	5230 4109	1766	
115/ 4W- 3K 1 5 10-21-57	69	8.2	3290	34 1.70 6	25 2.06 7	575 25.00 85	22	0	664 10.88 33	238 4.96 15	625 17.63 53	0	0.1	0	7	2465 1853	188	
115/ 4W- 4G 2 5 10- 5-61	72	8.0	2200	172 8.58 38	58 4.77 21	214 9.30 41	1	0	299 4.90 22	159 3.31 15	468 13.20 59	68 1.10 5	0.1	0.30	24	1718 1311	668	
115/ 4W- 4H 1 5 10-29-58	66	8.1	2155	94 4.69 22	48 3.95 19	283 12.30 58	5	0	205 3.36 16	156 3.25 15	510 14.38 68	2 0.03	0.9	0.20	16	1414 1216	432	
115/ 4W- 4J 1 5 6-20-58	--	7.6	2640	160 7.98 28	124 10.20 36	242 10.52 37	--	--	264 4.33 18	285 5.93 24	500 14.10 58	0.2	0.2	2.00	40	1850 1483	910	
115/ 4W- 4J 2 5 11-18-63	--	7.5	3300	234 11.68 30	126 10.36 27	380 16.92 43	8	0	267 4.38 12	296 6.16 17	943 26.59 71	7.0 0.11	0.4	0.29	19	2538 2145	1103	
115/ 4W- 4K 1 5 9-27-61	68	8.0	2000	148 7.39 35	52 4.28 20	213 9.26 44	7	0	238 3.90 19	169 3.52 17	479 13.51 64	6.2 0.10	0.2	0.15	18	1436 1210	584	
115/ 4W- 4K 3 5 10-29-58	70	7.7	3237	232 11.58 33	124 10.20 29	300 13.04 37	2	--	325 5.33 15	290 6.04 17	800 22.56 64	69 1.11 3	0.2	0.12	40	2208 2017	1090	
115/ 4W- 4M 1 5 10-11-63	--	8.2	1320	147 7.34 55	13 1.07 8	110 4.78 36	2	0	259 4.25 33	107 2.23 17	216 6.09 47	26 0.42 3	0.2	0.18	31	850 780	421	
115/ 4W- 4M 2 5 10-29-58	68	7.3	879	--	--	--	--	--	198 3.25	--	144 4.06	--	--	--	--		268	
115/ 4W- 4N 1 5 9-28-61	72	8.1	1480	130 6.49 42	43 3.54 23	118 5.13 34	5	0	308 5.05 34	123 2.56 17	249 7.02 47	24 0.39 3	0.2	0.18	25	940 869	502	
115/ 4W- 4P 2 5 10-24-63	--	7.3	1650	208 10.38 63	11 0.90 5	120 5.22 31	3	0	205 3.36 21	138 2.87 18	308 8.69 54	82 1.32 8	0.2	0.18	28	1148 999	564	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	Evap 180°C Evap 105°C Computed	TDS Total hardness as CaCO ₃		
Date sampled																			

BONSALL HYDRO SUBUNIT				SAN LUIS NEY HYDRO UNIT										Z0300				
				Z03A0														
115/ 4W- 40 2 S	68	7.6	2000	145	45	205	8	0	239	161	435	12	0.2	0.26	20	1342	547	
9-28-61				7.24	3.70	8.91	0.20		3.92	3.35	12.27	0.19						
				36	18	44	1		20	17	62	1					1149	
115/ 4W- 40 3 S	--	--	1989	--	--	--	--	--	--	--	440	--	--	--	--			
6-27-58											12.41							
115/ 4W- 4R 1 S	66	7.7	4566	356	145	525	12	--	317	363	1410	0	0.5	0.18	25	3910	1485	
10-28-58				17.76	11.92	22.83	0.31		5.20	7.56	39.76							
				34	23	43	1		10	14	76						2992	
115/ 4W- 4R 3 S	--	8.0	2527	167	71	240	--	12	235	200	572	3	--	--	--	714	709	
7- 0-58				8.33	5.84	10.44		0.40	3.85	4.16	16.13	0.05						
				34	24	42		2	16	17	66						1381	
115/ 4W- 5K 2 S	68	7.3	922	75	29	84	6	0	212	57	184	0	0.6	0.08	25	646	306	
3-27-59				3.74	2.38	3.65	0.15		3.47	1.19	5.19							
				38	24	37	2		35	12	53						565	
115/ 4W- 5K 5 S	65	7.9	876	69	27	88	6	--	271	72	123	2.0	0.7	0.04	30	515	283	
10-28-58				3.44	2.22	3.83	0.15		4.44	1.50	3.47	0.03						
				36	23	40	2		47	16	37						551	
115/ 4W- 5K 6 S	--	7.5	783	59	22	68	5	0	244	57	96	1.4	0.5	0.01	30	462	238	
3-16-60				2.94	1.81	2.96	0.13		4.00	1.19	2.71	0.02						
				38	23	38	2		51	15	34						459	
115/ 4W- 5L 1 S	--	7.7	2151	181	71	158	9	0	312	113	500	5.0	0.5	0.16	30	1580	744	
9-26-63				9.03	5.84	6.87	0.23		5.11	2.35	14.10	0.08						
				41	27	31	1		24	11	65						1221	
115/ 4W- 50 1 S	66	7.4	1000	74	32	95	5	0	193	81	137	7.5	0.5	0.12	29	625	316	
9-26-63				3.69	2.63	4.13	0.13		3.16	1.69	3.86	0.12						
				35	25	39	1		36	19	44	1					556	
115/ 4W- 50 4 S	69	7.7	1371	106	48	117	7	0	381	128	173	48	0.4	0.08	30	810	462	
9-27-61				5.29	3.95	5.09	0.18		6.24	2.66	4.88	0.77						
				36	27	35	1		43	18	34	5					845	
115/ 4W- 5R 1 S	--	7.4	1059	78	31	94	5	--	292	84	138	6.7	0.4	0.08	30	601	322	
2-10-60				3.89	2.55	4.09	0.13		4.79	1.75	3.89	0.11						
				36	24	38	1		45	17	37	1					611	
115/ 4W- 6R 1 S	70	8.7	3291	228	100	316	11	0	452	295	700	0	0.1	0.30	15	2105	981	
11-25-57				11.38	8.22	13.74	0.28		7.41	6.14	19.74							
				34	24	41	1		22	18	59						1888	
115/ 4W- 6R 2 S	72	8.0	2150	134	30	275	3	0	187	210	481	0	1.0	2.10	20	1462	458	
9-27-61				6.69	2.47	11.96	0.08		3.06	4.37	13.56							
				32	12	56			15	21	65						1248	
115/ 4W- 6R 4 S	--	7.4	4662	302	106	585	12	0	547	378	1140	2.5	0.5	0.56	29	3120	1190	
9-26-63				15.07	8.72	25.44	0.31		8.97	7.87	32.15	0.04						
				30	18	51	1		18	16	66						2824	
115/ 4W- 7J 1 S	68	7.7	2356	179	64	209	9	0	276	270	466	0.5	0.4	0.10	32	1549	710	
9-26-61				8.93	5.26	9.09	0.23		4.52	5.62	13.14	0.01						
				38	22	39	1		19	24	56						1366	
115/ 4W- 7J 2 S	--	8.0	1013	69	27	92	--	12	201	100	142	0	0	--	--	285	283	
7- 0-58				3.44	2.22	4.00		0.40	3.29	2.08	4.00							
				36	23	41		4	34	21	41						541	
115/ 4W- 7L 1 S	68	8.0	1820	37	35	305	13	0	104	264	379	6.5	0.6	1.40	1	1202	237	
11-18-63				1.85	2.88	13.26	0.33		1.70	5.50	10.69	0.10						
				10	16	72	2		9	31	59	1					1094	
115/ 4W- 7L 2 S	68	7.8	2420	133	91	290	10	0	292	398	482	0	0.4	0.54	13	1654	707	
11-18-63				6.64	7.48	12.61	0.26		4.79	8.29	13.59							
				25	28	47	1		18	31	51						1561	
115/ 4W- 7N 1 S	68	7.3	1488	83	51	146	12	0	268	45	332	29	0.2	0.10	4	870	417	
3- 2-64				4.14	4.19	6.35	0.31		4.39	0.94	9.36	0.47						
				28	28	42	2		29	6	62	3					834	
115/ 4W- 7P 1 S	67	7.5	1700	168	46	136	--	--	256	192	350	0.1	0.2	2.00	30	1180	608	
11- 4-58				8.38	3.78	5.91			4.20	4.00	9.87							
				46	21	33			23	22	55						1050	
115/ 4W- 7P 2 S	68	7.9	1282	95	36	112	6	0	270	135	207	0	0.2	0	17	884	385	
10-30-58				4.74	2.96	4.87	0.15		4.43	2.81	5.84							
				37	23	38	1		34	21	45						741	
115/ 4W- 70 1 S	--	7.8	1351	99	57	110	--	--	290	170	206	0	--	--	--	485	482	
7- 0-58				4.94	4.69	4.78			4.75	3.54	5.81							
				34	33	33			34	25	41						785	
115/ 4W- 70 2 S	67	7.7	1617	128	47	134	7	0	270	188	272	1.2	0.5	0.09	33	1004	513	
1- 8-63				6.39	3.87	5.83	0.18		4.43	3.91	7.67	0.02						
				39	24	36	1		28	24	48						943	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃
Date sampled																	

BONSALL HYDRO SUBUNIT				Z03A0				SAN LUIS KEY HYDRO UNIT				Z0300							
11S/ 4W- 7R 2 S 9-26-63	--	7.4	1326	94 4.69 34	33 2.71 20	141 6.13 45	6 0.15 1	0	260 4.26 32	144 3.00 23	208 5.87 45	1.1 0.02	0.5	0.13	28	864 784	370		
11S/ 4W- 8B 1 S 10-11-63	--	7.8	1330	103 5.14 37	31 2.55 18	140 6.09 44	6 0.15 1	0	283 4.64 34	158 3.29 24	206 5.81 42	1.8 0.03	0.1	0.27	26	864 811	385		
11S/ 4W- 8B 3 S 9-28-61	74	7.9	1712	128 6.39 36	54 4.44 25	154 6.70 38	8 0.20 1	0	339 5.56 31	189 3.93 22	291 8.21 46	0.5 0.01	0.4	0.08	30	1010 1022	542		
11S/ 4W- 8C 3 S 9-27-61	68	8.1	2100	180 8.98 41	67 5.51 25	170 7.39 34	6 0.15 1	0	302 4.95 23	190 3.96 18	452 12.75 59	0	0.3	0.18	21	1600 1235	725		
11S/ 4W- 8E 1 S 10-25-63	--	8.0	1650	187 9.33 54	24 1.97 11	134 5.83 34	7 0.18 1	0	292 4.79 28	179 3.73 21	314 8.85 51	0	0.1	0.12	25	1198 1014	565		
11S/ 4W- 8E 2 S 9-25-63	76	7.7	1721	149 7.44 41	55 4.52 25	135 5.87 33	8 0.20 1	0	312 5.11 29	184 3.83 21	314 8.85 50	2.5 0.04	0.5	0.12	28	1150 1030	598		
11S/ 4W- 8H 1 S 9-25-63	--	7.6	2874	195 9.73 32	89 7.32 24	308 13.39 44	9 0.23 1	0	380 6.23 21	363 7.56 25	565 15.93 54	2.2 0.04	0.6	0.12	26	1895 1745	853		
11S/ 4W- 8J 1 S 9-28-61	72	7.8	3270	209 10.43 31	95 7.81 24	341 14.83 45	6 0.15	0	368 6.03 19	270 5.62 17	728 20.53 63	13 0.21 1	0.5	0.21	33	2105 1877	913		
11S/ 4W- 8J 2 S 10- 4-61	74	7.2	2440	154 7.68 30	74 6.09 23	270 11.74 45	18 0.46 2	0	351 5.75 22	280 5.83 23	496 13.99 54	10 0.16 1	0.1	0.30	27	1286 1502	689		
11S/ 4W- 8J 3 S 4-10-62	70	7.3	7900	546 27.25 30	176 14.47 16	1100 47.83 53	13 0.33	0	375 6.15 7	1156 24.07 27	2137 60.26 67	0	0.1	0.57	29	5864 5342	2088		
11S/ 4W- 8K 1 S 9-26-63	--	7.3	1499	160 7.98 52	19 1.56 10	128 5.57 37	4 0.10 1	0	249 4.08 27	123 2.56 17	280 7.90 53	30 0.48 3	0.4	0.52	36	1080 903	477		
11S/ 4W- 8L 1 S 9-26-63	--	7.3	1869	141 7.04 36	56 4.61 23	180 7.83 40	6 0.15 1	0	398 6.52 33	158 3.29 17	314 8.85 45	50 0.81 4	0.4	0.18	32	1175 1133	583		
11S/ 4W- 8L 2 S 9-26-63	--	7.2	2331	176 8.78 35	81 6.66 26	220 9.57 38	7 0.18 1	0	432 7.08 28	280 5.83 23	405 11.42 46	35 0.56 2	0.5	0.42	37	1620 1454	773		
11S/ 4W- 8L 3 S 9-26-63	--	7.7	1736	113 5.64 32	29 2.38 14	215 9.35 54	3 0.08	0	261 4.28 25	170 3.54 20	334 9.42 55	2.5 0.04	0.6	0.24	24	1095 1020	401		
11S/ 4W- 8M 1 S 9-26-63	--	7.6	1761	144 7.19 39	54 4.44 24	155 6.74 36	8 0.20 1	0	295 4.84 26	260 5.41 29	290 8.18 44	2.5 0.04	0.6	0.12	26	1190 1085	582		
11S/ 4W- 8N 1 S 11-28-62	--	7.5	2720	227 11.33 38	60 4.93 17	310 13.48 45	2 0.05	0	321 5.26 17	256 5.33 18	692 19.51 65	0	0.4	0.41	20	1814 1726	814		
11S/ 4W- 8N 2 S 10-24-63	--	7.7	2360	210 10.48 41	23 1.89 7	295 12.63 51	3 0.08	0	322 5.28 21	173 3.60 14	575 16.22 65	0	0.2	0.30	21	1582 1459	619		
11S/ 4W- 8N 3 S 4-10-62	--	7.5	1725	136 6.79 39	50 4.11 24	145 6.30 36	6 0.15 1	0	287 4.70 27	205 4.27 24	301 8.49 49	0	0.4	0.17	19	1050 1004	545		
11S/ 4W- 8R 1 S 10- 3-61	--	7.5	3796	264 13.17 33	106 8.72 22	410 17.83 45	6 0.15	0	339 5.56 14	300 6.25 16	975 27.50 70	14 0.23 1	0.6	0.24	29	2330 2271	1095		
11S/ 4W- 8R 2 S 10-21-57	--	7.3	1381	100 4.99 35	38 3.13 22	134 5.83 41	5 0.13 1	0	183 3.00 21	336 7.00 48	160 4.51 31	0.0	0.4	0.19	10	862 873	406		
11S/ 4W- 9B 1 S 8- 0-54	--	--	1831	--	--	--	--	--	--	--	284 8.01	--	--	--	--	--	--		
11S/ 4W- 9C 1 S 10-29-58	66	7.8	1229	93 4.64 37	34 2.80 23	111 4.83 39	6 0.15 1	--	303 4.97 40	97 2.02 16	194 5.47 44	6.8 0.11 1	0.2	0.07	30	745 721	372		
11S/ 4W- 9F 1 S 10-25-63	68	7.3	3700	307 15.32 38	96 7.90 20	389 16.91 42	7 0.18	0	467 7.65 19	327 6.81 17	901 25.41 64	0	0.2	0.39	28	2496 2285	1162		

State well number	Temp. when sampled in °F	pH	Specific conductance (microhmhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap. 180°C Computed	Total hardness as CaCO ₃	
Date sampled																		

BON5ALL HYDRO SUBUNIT				SAN LUIS REY HYDRO UNIT										Z0300					
203A0																			
115/ 4W- 9G 1 S	70	7.6	3400	214	101	400	5	0	449	297	796	0	0.2	0.41	25	2310	950		
9-25-61				10.68	8.31	17.39	0.13		7.36	6.18	22.50								
				29	23	48			20	17	62							2061	
115/ 4W- 9H 1 S	68	7.7	8640	281	223	1251	5	0	384	608	2363	0	0.3	0.20	16	5750	1619		
10-22-57				14.02	18.34	54.39	0.13		6.29	12.66	66.64								
				16	21	63			7	15	78							4936	
115/ 4W- 9H 2 S	74	7.9	4914	191	102	700	4	0	220	331	1370	2.5	0.8	0.76	24	5030	897		
9-25-61				9.53	8.39	30.44	0.10		3.61	6.89	38.63	0.04							
				20	17	63			7	14	79							2834	
115/ 4W- 9L 1 S	69	7.7	10600	567	413	2570	1	0	502	6791	771	0	1.0	1.95	7	11918	3115		
11-18-63				28.29	33.97	111.74	0.03		8.23	141.39	21.74								
				16	20	64			5	83	13							11370	
115/ 4W- 9N 1 S	--	7.6	1400	79	21	217	2	0	334	19	312	9.1	0.8	0.39	22	872	284		
11-18-63				3.94	1.73	9.44	0.05		5.47	0.40	8.80	0.15							
				26	11	62			37	3	59	1						846	
115/ 4W- 9P 1 S	--	--	878	82	28	83	--	--	293	83	124	--	--	--	--				320
10- 0-54				4.09	2.30	3.61			4.80	1.73	3.50								
115/ 4W-108 1 S	70	7.8	2010	145	33	200	4	0	142	36	530	26	0.4	0.14	50	1580	498		
10- 8-59				7.24	2.71	8.70	0.10		2.33	0.75	14.95	0.42							
				39	14	46	1		13	4	81	2						1094	
115/ 4W-11K 1 S	--	7.0	2610	182	54	256	2	0	166	21	758	4.0	0.8	0.14	5	2080	677		
10- 8-59				9.08	4.44	11.13	0.05		2.72	0.44	21.38	0.06							
				37	18	45			11	2	87							1365	
115/ 4W-12E 1 S	--	6.9	4200	285	113	430	2	0	508	96	1115	0	0.6	0.48	50	3175	1176		
10- 8-59				14.22	9.29	18.70	0.05		8.33	2.00	31.44								
				34	22	44			20	5	75							2342	
115/ 4W-178 1 S	--	--	2065	--	--	--	--	--	--	--	451	--	--	--	--				
6-27-58											12.72								
115/ 4W-170 1 S	--	7.1	2125	150	57	185	1	0	384	37	475	1.6	0.2	0.25	31	1295	609		
12-20-57				7.49	4.69	8.04	0.03		6.29	0.77	13.40	0.03							
				37	23	40			31	4	65							1127	
115/ 4W-188 1 S	68	8.1	1140	94	28	115	3	0	279	119	192	0	0.3	0.18	23	842	350		
10- 4-61				4.69	2.30	5.00	0.08		4.57	2.48	5.41								
				39	19	41	1		37	20	43							712	
115/ 4W-18C 1 S	--	7.4	1608	126	52	146	7	0	287	193	271	0.5	0.4	0.12	28	1048	529		
9-25-63				6.29	4.28	6.35	0.18		4.70	4.02	7.64	0.01							
				37	25	37	1		29	25	47							965	
115/ 4W-18C 3 S	--	--	2101	168	47	200	--	--	262	346	337	--	--	--	--				613
8-10-54				8.38	3.87	8.70			4.29	7.20	9.50								
115/ 4W-18C 4 S	--	7.4	2439	204	76	230	10	0	329	407	434	3.7	0.6	0.15	30	1810	822		
9-27-63				10.18	6.25	10.00	0.26		5.39	8.47	12.24	0.06							
				38	23	37	1		21	32	47							1557	
115/ 4W-18C 5 S	--	7.3	2310	195	71	214	9	0	322	344	426	3.7	0.5	0.14	31	1645	779		
9-27-63				9.73	5.84	9.30	0.23		5.28	7.16	12.01	0.06							
				39	23	37	1		22	29	49							1453	
115/ 4W-18C 6 S	70	7.5	2650	266	29	275	9	0	318	372	514	0	0.1	0.27	17	1728	783		
10-11-63				13.27	2.38	11.96	0.23		5.21	7.75	14.49								
				48	9	43	1		19	28	53							1639	
115/ 4W-18C 7 S	--	--	2387	--	--	--	--	--	--	--	405	--	--	--	--				
6-27-58											11.42								
115/ 4W-18C 8 S	68	7.9	2500	220	77	250	8	0	306	305	599	0	0.2	0.23	22	2012	866		
11-28-62				10.98	6.33	10.87	0.20		5.05	6.35	16.89								
				39	22	38	1		18	22	60							1633	
115/ 4W-18C 9 S	--	7.6	2387	206	74	210	9	0	332	331	454	3.7	0.4	0.21	31	1685	819		
9-27-63				10.28	6.09	9.13	0.23		5.44	6.89	12.80	0.06							
				40	24	35	1		22	27	51							1483	
115/ 4W-18E 1 S	70	7.0	1240	40	19	207	1	0	89	114	303	7.5	0.1	0.12	2	878	178		
10-11-63				2.00	1.56	9.00	0.03		1.46	2.37	8.54	0.12							
				16	12	71			12	19	68	1						737	
115/ 4W-18F 1 S	68	7.5	2660	132	132	277	10	0	354	473	505	2.5	0.4	0.26	23	1845	873		
3-13-64				6.59	10.86	12.04	0.26		5.80	9.85	14.24	0.04							
				22	37	40	1		19	33	48							1729	
115/ 4W-18G 2 S	68	7.4	2516	196	79	207	8	0	317	382	452	1.1	0.5	0.12	33	1751	815		
1- 8-63				9.78	6.50	9.00	0.20		5.20	7.95	12.75	0.02							
				38	26	35	1		20	31	49							1515	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value							Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂
Date sampled															

BONSALL HYDRO SUBUNIT				SAN LUIS REY HYDRO UNIT									20300					
203A0																		
11S/ 4W-18G 6 S	--	--	1884	--	--	--	--	--	--	--	231	--	--	--	--			
6-27-58											6.51							
11S/ 4W-18L 1 S	--	7.8	--	204	72	198	5	--	283	487	345	0.1	0.1	--	--		806	
8-15-60				10.18	5.92	8.61	0.13		4.64	10.14	9.73					1450		
				41	24	35	1		19	41	40							
11S/ 4W-18L 2 S	--	7.7	2049	163	62	185	8	0	351	205	390	3.7	0.4	0.17	30	1390	662	
9-27-63				8.13	5.10	8.04	0.20		5.75	4.27	11.00	0.06				1220		
				38	24	37	1		27	20	52							
11S/ 4W-18L 3 S	68	7.2	2325	313	53	213	7	0	337	655	343	0	0.2	0.23	23	1868	1000	
11-26-62				15.62	4.36	9.26	0.18		5.52	13.64	9.67					1773		
				53	15	31	1		19	47	34							
11S/ 4W-18L 4 S	--	7.4	1280	108	43	105	6	0	293	157	188	0.5	0.5	0.11	30	900	447	
9-27-63				5.39	3.54	4.57	0.15		4.80	3.27	5.30	0.01				782		
				39	26	33	1		36	24	40							
11S/ 4W-18L 7 S	68	7.4	2012	177	74	144	8	0	320	415	255	1.5	0.5	0.10	29	1285	747	
9-26-61				8.83	6.09	6.26	0.20		5.24	8.64	7.19	0.02				1261		
				41	28	29	1		25	41	34							
11S/ 5W-13B 1 S	64	7.3	2800	128	72	355	2	0	264	181	701	0	0.4	0.23	21	1736	616	
9-28-61				6.39	5.92	15.44	0.05		4.33	3.77	19.77					1590		
				23	21	56			16	14	71							
11S/ 5W-13B 2 S	--	7.4	2053	93	55	262	3	0	244	120	478	2.5	0.7	0.16	22	1250	458	
9-26-63				4.64	4.52	11.39	0.08		4.00	2.50	13.48	0.04				1156		
				22	22	55			20	12	67							
11S/ 5W-13L 1 S	--	7.7	3135	294	127	240	10	0	344	547	665	1.2	0.4	0.12	29	2320	1257	
3- 3-64				14.67	10.44	10.44	0.26		5.64	11.39	18.75	0.02				2083		
				41	29	29	1		16	32	52							
11S/ 5W-13L 2 S	64	7.3	17730	261	800	3050	18	0	81	2056	5975	6.2	0.6	0.96	3	13340	3944	
3- 2-64				13.02	65.79	132.61	0.46		1.33	42.81	168.50	0.10				12211		
				6	31	63			1	20	79							
11S/ 5W-13N 2 S	67	7.6	1667	32	40	236	13	0	173	192	310	6	0.3	0.16	--	933	245	
3-12-64				1.60	3.29	10.26	0.33		2.84	4.00	8.74	0.10				914		
				10	21	66	2		18	26	56	1						
11S/ 5W-13N 3 S	--	8.0	7000	212	162	1227	2	0	123	53	2598	0	0.2	0.22	1	4962	1196	
11-18-63				10.58	13.32	53.35	0.05		2.02	1.10	73.26					4316		
				14	17	69			3	1	96							
11S/ 5W-13P 1 S	70	6.6	15200	389	361	2750	33	0	50	304	5670	0	0.1	0.40	3	11480	2457	
10-10-63				19.41	29.69	119.57	0.84		0.82	6.33	159.89					9535		
				11	18	71				4	96							
11S/ 5W-13P 2 S	68	7.1	15460	326	410	2630	47	0	43	316	5625	21	0.6	1.00	--	9845	2501	
3-12-64				16.27	33.72	114.35	1.20		0.70	6.58	158.63	0.34				9398		
				10	20	69	1			4	95							
11S/ 5W-13Q 1 S	64	6.9	6313	478	207	545	16	0	292	317	1840	1	0.4	0.10	30	4730	2045	
9-27-61				23.85	17.02	23.70	0.41		4.79	6.60	51.89	0.02				3578		
				37	26	36	1		8	10	82							
11S/ 5W-13Q 3 S	--	7.0	10893	670	317	1440	22	0	256	535	3800	5.0	0.4	0.22	26	8000	2977	
3- 2-64				33.43	26.07	62.61	0.56		4.20	11.14	107.16	0.08				6941		
				27	21	51			3	9	87							
11S/ 5W-140 1 S	--	6.4	9094	321	214	1288	35	0	31	265	2950	0	0	0.44	2	5730	1682	
1-18-62				16.02	17.60	56.00	0.89		0.51	5.52	83.19					5091		
				18	19	62	1		1	6	93							
11S/ 5W-23E 1 S	67	5.6	19920	387	593	3405	74	0	10	610	7228	0	0.7	0.66	1	14270	3407	
3-12-64				19.31	48.77	148.05	1.89		0.16	12.70	203.83					12304		
				9	22	68	1			6	94							
11S/ 5W-23E 2 S	69	7.0	20500	500	590	4200	80	0	315	1033	7358	0	0	1.10	19	16256	3676	
3-26-61				24.95	48.52	182.62	2.05		5.16	21.51	207.50					13936		
				10	19	71	1		2	9	89							
11S/ 5W-23E 3 S	64	7.8	17250	446	474	3400	55	0	318	879	6773	0	0.2	0.84	19	12446	3064	
11-26-62				22.26	38.98	147.83	1.41		5.21	18.30	191.00					12203		
				11	19	70	1		2	9	89							
11S/ 5W-23E 4 S	69	6.7	22381	557	648	3875	70	0	298	1057	8050	3.7	0.9	1.08	21	15320	4057	
9-26-61				27.79	53.29	168.49	1.79		4.88	22.01	227.01	0.06				14430		
				11	21	67	1		2	9	89							
11S/ 5W-24B 1 S	67	8.2	1227	12	12	230	5	0	122	92	279	0	0	0.50	3	792	80	
10-21-57				0.60	0.99	10.00	0.13		2.00	1.92	7.87					693		
				5	8	85	1		17	16	67							
11S/ 5W-24B 2 S	68	7.7	2695	126	104	292	11	0	171	270	690	2.5	0.2	0.16	6	1740	743	
3-13-64				6.29	8.55	12.70	0.28		2.80	5.62	19.46	0.04				1586		
				23	31	46	1		10	20	70							

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

MONSERATE HYDRO SUBUNIT				SAN LUIS REY HYDRO UNIT										Z0300					
				Z0380															
95/ 2W-23K 1 S	72	7.7	695	62	19	56	4	0	263	58	63	0	0.2	0.05	34	426	233		
8-21-63				3.09	1.56	2.43	0.10		4.31	1.21	1.78								
				43	22	34	1		59	17	24					426			
95/ 2W-23Q 1 S	74	8.2	650	43	29	56	3	0	264	29	66	3.2	0.1	0.29	--	404	227		
6-12-64				2.15	2.38	2.43	0.08		4.33	0.60	1.86	0.05							
				31	34	35	1		63	9	27	1				359			
95/ 2W-26M 1 S	72	8.2	635	48	27	52	4	0	252	60	56	4	0.2	0.05	--	392	231		
6-12-64				2.40	2.22	2.26	0.10		4.13	1.25	1.58	0.06							
				34	32	32	1		59	18	23	1				375			
95/ 2W-26P 1 S	--	8.0	720	81	19	52	5	0	195	160	53	0	0.2	0.08	32	522	280		
10-25-63				4.04	1.56	2.26	0.13		3.20	3.33	1.49								
				51	20	28	2		40	42	19					498			
95/ 2W-27G 1 S	--	7.6	650	38	34	45	3	0	238	65	54	4.6	0.1	0.05	29	424	235		
8-21-63				1.90	2.80	1.96	0.08		3.90	1.35	1.52	0.07							
				28	42	29	1		57	20	22	1				390			
95/ 2W-28N 1 S	--	7.1	745	60	22	62	2	0	201	77	93	2	0.2	0.18	39	520	240		
2-12-59				2.99	1.81	2.70	0.05		3.29	1.60	2.62	0.03							
				40	24	36	1		44	21	35					456			
95/ 2W-28N 2 S	--	7.3	894	80	30	70	2	0	228	149	94	0	0.2	0.15	30		323		
11-16-60				3.99	2.47	3.04	0.05		3.74	3.10	2.65					644			
				42	26	32	1		39	33	28					567			
95/ 2W-31Q 1 S	70	7.7	1410	140	55	95	3	0	344	171	214	12	0.2	0.23	35	1056	576		
10-25-63				6.99	4.52	4.13	0.08		5.64	3.56	6.03	0.19							
				44	29	26	1		37	23	39	1				895			
95/ 2W-32A 1 S	70	8.2	760	68	24	58	5	0	232	110	60	0	0.3	0.13	26		268		
11- 4-60				3.39	1.97	2.52	0.13		3.80	2.29	1.69					522			
				42	25	31	2		49	29	22					465			
95/ 2W-32G 1 S	70	7.8	846	80	27	61	5	0	229	162	65	0	0.3	0.18	26		311		
11- 4-60				3.99	2.22	2.65	0.13		3.75	3.37	1.83					572			
				44	25	29	1		42	38	20					539			
95/ 2W-32L 1 S	71	7.3	1000	64	47	76	4	0	242	194	85	0	0.2	0.16	25	658	353		
7-21-63				3.19	3.87	3.30	0.10		3.97	4.04	2.40								
				30	37	32	1		38	39	23					614			
95/ 2W-36B 1 S	--	8.1	371	25	5	40	4	0	58	65	37	3.6	0.5	0.02	4	202	83		
3- 8-61				1.25	0.41	1.74	0.10		0.95	1.35	1.04	0.06							
				36	12	50	3		28	40	31	2				213			
95/ 2W-36M 1 S	69	7.1	640	65	18	46	4	0	162	150	41	5.1	0.2		0	412	236		
8-22-63				3.24	1.48	2.00	0.10		2.66	3.12	1.16	0.08							
				48	22	29	1		38	44	17	1				437			
95/ 2W-36M 2 S	--	7.0	630	63	18	41	4	0	156	131	37	5.6	0.4	0.02	32	407	231		
3- 8-61				3.14	1.48	1.78	0.10		2.56	2.73	1.04	0.09							
				48	23	27	2		40	43	16	1				409			
105/ 1W- 5L 1 S	--	7.2	780	89	27	40	4	0	246	224	39	13	0.3	0.03	33	562	333		
3- 8-61				4.44	2.22	1.74	0.10		4.03	4.66	1.10	0.21							
				52	26	20	1		40	47	11	2				590			
105/ 1W- 5N 1 S	70	7.3	790	80	31	43	5	0	156	242	38	6.8	0.2	0.08	29	564	327		
8-22-63				3.99	2.55	1.87	0.13		2.56	5.04	1.07	0.11							
				47	30	22	2		29	57	12	1				552			
105/ 1W- 9B 1 S	--	8.0	313	49	13	23	4	0	101	96	16	29	0	0.03	40	313	176		
4-17-59				2.45	1.07	1.00	0.10		1.66	2.00	0.45	0.47							
				53	23	22	2		36	44	10	10				320			
105/ 1W- 9M 1 S	70	7.7	494	47	10	35	4	0	150	86	19	2.4	0.2	0.11	26	276	159		
11- 2-60				2.35	0.82	1.52	0.10		2.46	1.79	0.54	0.04							
				49	17	32	2		51	37	11	1				303			
105/ 1W-10M 1 S	--	7.1	1007	134	40	56	9	0	172	423	42	2	0.2	0.26	30	794	499		
2-11-59				6.69	3.29	2.43	0.23		2.82	8.81	1.18	0.03							
				53	26	19	2		22	69	9					821			
105/ 1W-10M 2 S	--	8.0	1300	146	54	81	11	0	149	583	50	1.8	0.5	0.05	16	1073	587		
2-11-59				7.29	4.44	3.52	0.28		2.44	12.14	1.41	0.03							
				47	29	23	2		15	76	9					1019			
105/ 1W-16E 1 S	68	7.2	1100	115	44	71	4	0	198	347	62	5.8	0.1	0.13	29	808	468		
8-22-63				5.74	3.62	3.09	0.10		3.25	7.22	1.75	0.09							
				46	29	25	1		26	59	14	1				775			
105/ 1W-16M 1 S	--	7.8	445	45	13	40	3	0	183	55	39	3.6	0.2	0.05	30	302	166		
11-21-63				2.25	1.07	1.74	0.08		3.00	1.15	1.10	0.06							
				44	21	34	2		56	22	21	1				319			
105/ 1W-16M 2 S	76	7.2	581	40	18	47	3	0	189	43	57	11.1	0	0	--		174		
9-27-56				2.00	1.48	2.04	0.08		3.10	0.90	1.61	0.18				344			
				36	26	36	1		54	16	28	3				312			

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

MONSERATE HYDRO SUBUNIT				SAN LUIS REY HYDRO UNIT										20300									
				20380																			
10S/ 1W-16R 1 S	68	7.1	1300	157	53	69	5	0	188	528	47	7.7	0.2	0.11	31	1080	610						
8-22-63				7.83	4.36	3.00	0.13		3.08	10.99	1.33	0.12											
				51	28	20	1		20	71	9	1				990							
10S/ 1W-17A 1 S	--	8.0	955	73	27	46	4	0	174	197	43	0	0.2	0.15	22		293						
11- 3-60				3.64	2.22	2.00	0.10		2.85	4.10	1.21					500							
				46	28	25	1		35	50	15					498							
10S/ 1W-17B 1 S	--	7.1	544	37	25	43	3	0	185	74	40	1.9	0.4		0	23	368	196					
11- 3-60				1.85	2.06	1.87	0.08		3.03	1.54	1.13	0.03											
				32	35	32	1		53	27	20	1				338							
10S/ 1W-17C 1 S	--	7.1	580	50	17	42	3	0	183	77	45	1.7	0.2	0.07	27		195						
7-18-61				2.50	1.40	1.83	0.08		3.00	1.60	1.27	0.03				360							
				43	24	31	1		51	27	22	1				353							
10S/ 1W-20B 1 S	--	8.1	446	25	13	47	3	0	162	9	48	3.7	0	0.11	52	265	116						
4-17-59				1.25	1.07	2.04	0.08		2.66	0.19	1.35	0.06											
				28	24	46	2		62	4	32	1				280							
10S/ 1W-22B 1 S	--	7.9	506	49	16	35	3	0	179	65	31	2.1	0.2	0.11	35		189						
11- 3-60				2.45	1.32	1.52	0.08		2.93	1.35	0.87	0.03				342							
				46	25	28	1		57	26	17	1				324							
10S/ 1W-22D 1 S	--	7.8	625	53	16	41	4	0	179	86	37	4.4	0.2	0.03	31		198						
11- 3-60				2.64	1.32	1.78	0.10		2.93	1.79	1.04	0.07				368							
				45	23	30	2		50	31	18	1				361							
10S/ 1W-22L 1 S	70	7.2	543	49	16	40	4	0	186	43	49	6.0	0.2	0.05	31		189						
7-18-61				2.45	1.32	1.74	0.10		3.05	0.90	1.38	0.10				326							
				44	24	31	2		56	17	25	2				330							
10S/ 1W-22P 1 S	--	7.7	520	45	17	50	3	0	206	58	41	5.8	0.2	0.09	27	348	183						
11-21-63				2.25	1.40	2.17	0.08		3.38	1.21	1.16	0.09											
				38	24	37	1		58	21	20	2				348							
10S/ 1W-23K 1 S	69	7.7	439	38	13	32	4	0	161	54	20	3.6	0.3		0	48	259	149					
4-24-61				1.90	1.07	1.39	0.10		2.64	1.12	0.56	0.06											
				43	24	31	2		60	26	13	1				292							
10S/ 1W-23N 1 S	80	7.4	395	42	12	29	5	0	151	72	16	2.3	0.4	0.02	45		155						
6-15-56				2.10	0.99	1.26	0.13		2.47	1.50	0.51	0.04				310							
				47	22	28	3		55	33	11	1				300							
10S/ 1W-23N 2 S	--	7.3	545	50	16	42	3	0	182	77	33	5.8	0.2	0.03	35	334	191						
8-22-63				2.50	1.32	1.83	0.08		2.98	1.60	0.93	0.09											
				44	23	32	1		53	29	17	2				351							
10S/ 1W-35C 1 S	71	7.5	550	54	12	49	3	0	220	46	51	1.3	0.2	0.03	26	328	184						
8-22-63				2.69	0.99	2.13	0.08		3.61	0.96	1.44	0.02											
				46	17	36	1		60	16	24					351							
10S/ 1W-36H 1 S	68	7.0	994	72	24	63	3	0	241	85	92	6.5	0.3	0.51	33		278						
11- 7-60				3.59	1.97	2.74	0.08		3.95	1.77	2.59	0.10				550							
				43	24	33	1		47	21	31	1				498							
10S/ 1W-36J 1 S	65	7.0	946	84	32	73	4	0	252	120	117	21	0.3	0.11	29		341						
11- 7-60				4.19	2.63	3.17	0.10		4.13	2.50	3.30	0.34				624							
				42	26	31	1		40	24	32	3				604							
10S/ 2W- 6F 2 S	68	7.9	1065	107	33	66	6	0	217	194	125	0	0.2	0.13	26		403						
11- 2-60				5.34	2.71	2.87	0.15		3.56	4.04	3.53					772							
				48	24	26	1		32	36	32					664							
10S/ 2W- 6G 1 S	67	7.4	1040	91	33	86	5	0	273	211	84	0	0.2	0.11	26	694	363						
8-22-63				4.54	2.71	3.74	0.13		4.47	4.39	2.37												
				41	24	34	1		40	39	21					671							
11S/ 1W-110 1 S	--	7.3	640	61	13	53	3	0	228	34	74	2.1	0.1	0.13	29	398	206						
8-22-63				3.04	1.07	2.30	0.08		3.74	0.71	2.09	0.03											
				47	16	35	1		57	11	32					381							
11S/ 1W-11E 1 S	--	7.3	860	86	26	62	3	0	267	72	117	4.3	0.2	0.05	30	552	322						
8-22-63				4.29	2.14	2.70	0.08		4.38	1.50	3.30	0.07											
				47	23	29	1		47	16	36	1				532							
WARNER HYDRO SUBUNIT				20300																			
9S/ 2E-36N 1 S	--	7.5	905	85	24	80	3	0	387	64	71	8.1	0.3	0.05	52	523	311						
8- 9-62				4.24	1.97	3.48	0.08		6.34	1.33	2.00	0.13											
				43	20	36	1		65	14	20	1				578							
9S/ 2E-36O 1 S	--	7.0	722	62	19	60	4	0	143	156	59	12	0.3	0.02	50	469	233						
8- 9-62				3.09	1.56	2.61	0.10		2.34	3.25	1.66	0.19											
				42	21	35	1		31	44	22	3				493							
10S/ 2E- 1A 1 S	--	7.4	660	58	19	52	2	0	218	48	71	8.1	0.3	0.07	--		223						
5- 3-56				2.89	1.56	2.26	0.05		3.57	1.00	2.00	0.13				437							
				43	23	33	1		53	15	30	2				366							

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃

WARNER HYDRO SUBUNIT				SAN LUIS RLY HYDRO UNIT								20300					
10S/ 2E- 1A 2 S	--	6.9	525	35	15	47	6	0	104	120	35	5.0	0.4	0.02	56	347	149
8- 9-62				1.75	1.23	2.04	0.15		1.70	2.50	0.99	0.08				371	
				34	24	39	3		32	47	19	2					
10S/ 2E-26A 1 S	--	8.2	455	37	10	41	2	0	150	62	26	0.3	0.4	0.11	21	323	134
6-26-57				1.85	0.82	1.78	0.05		2.46	1.29	0.73					274	
				41	18	40	1		55	29	16						
10S/ 3E- 8R 1 S	--	8.1	--	44	11	46	2	--	125	80	33	0.1	0.4	--	--	340	155
1- 4-60				2.20	0.90	2.00	0.05		2.05	1.67	0.93					278	
				43	17	39	1		44	36	20						
10S/ 3F-250S1 S	129	9.4	420	5	1	99	2	39	43	45	47	0	8.0	0.71	62	372	17
11-20-63				0.25	0.08	4.30	0.05	1.30	0.70	0.94	1.33					330	
				5	2	92	1	30	16	22	31						
10S/ 3E-26L 1 S	--	7.9	400	32	10	54	3	0	216	7	27	11	0.2	0.11	20	268	121
11-20-63				1.60	0.82	2.35	0.08		3.54	0.15	0.76	0.18				271	
				33	17	48	2		76	3	16	4					
10S/ 3E-26L 2 S	--	7.4	556	--	--	--	--	0	250	--	37	--	--	--	--		178
8-16-60									4.10		1.04						
10S/ 3E-26L 3 S	--	7.7	465	38	9	52	4	0	217	5	34	17	0.4	0.05	23	261	132
4-27-62				1.90	0.74	2.26	0.10		3.56	0.10	0.96	0.27				284	
				38	15	45	2		73	2	20	6					
10S/ 3E-29J 1 S	65	8.1	855	42	9	92	1	0	244	55	64	2.4	0.6	0.09	--		142
8- 5-55				2.10	0.74	4.00	0.03		4.00	1.15	1.80	0.04				399	
				31	11	58			57	16	26	1				386	
10S/ 3E-29L 1 S	66	7.7	709	45	12	66	2	0	241	45	50	3.5	0.5	0.20	--		162
8- 5-55				2.25	0.99	2.87	0.05		3.95	0.94	1.41	0.06				357	
				37	16	47	1		62	15	22	1				343	
10S/ 3E-30A 1 S	69	7.9	1138	56	14	152	2	0	189	189	128	2.8	1.1	0.12	--		197
8- 5-55				2.79	1.15	6.61	0.05		3.10	3.93	3.61	0.05				672	
				26	11	62			29	37	34					636	
10S/ 3E-33F 1 S	68	8.4	658	35	6	70	2	2	163	55	51	3.5	0.2	0	--		112
8- 5-55				1.75	0.49	3.04	0.05	0.07	2.67	1.15	1.44	0.06				308	
				33	9	57	1	1	50	21	27	1				305	
10S/ 3E-33H 1 S	--	8.3	449	34	7	50	2	--	193	24	39	6.4	0.6	0.05	--		114
9- 2-54				1.70	0.58	2.17	0.05		2.51	0.50	1.10	0.10				271	
				38	13	48	1		60	12	26	2				238	
10S/ 3E-33L 1 S	--	8.0	505	42	8	50	2	--	186	36	43	4.6	0.6	0.12	--		138
9- 2-54				2.10	0.66	2.17	0.05		3.05	0.75	1.21	0.07				302	
				42	13	44	1		60	15	24	1				278	
10S/ 3E-33P 1 S	68	7.5	450	41	10	--	--	--	200	--	43	--	--	--	--	320	144
9-13-56				2.05	0.82				3.28		1.21						
10S/ 3E-34M 1 S	69	7.7	482	32	4	65	2	0	140	51	48	6.7	0.2	0.07	25	285	97
4-27-62				1.60	0.33	2.83	0.05		2.29	1.06	1.35	0.14				305	
				33	7	59	1		47	22	28	3					
11S/ 2E-24F 1 S	68	6.8	402	38	10	23	6	0	104	76	21	3.7	0.3	0.03	48	267	136
6-11-61				1.90	0.62	1.00	0.15		1.70	1.58	0.59	0.06				277	
				49	21	26	4		43	40	15	2					
11S/ 2E-24G51 S	--	7.5	319	33	7	23	6	0	132	26	20	1.2	0.1	0.10	--		112
8-20-53				1.65	0.58	1.00	0.15		2.16	0.58	0.56	0.02				216	
				49	17	30	4		65	17	17	1				183	
11S/ 2E-26A51 S	54	7.1	175	11	3	21	3	--	61	--	17	0.4	--	0.37	--		40
11- 3-52				0.66	0.25	0.91	0.08		1.00		0.48	0.01					
11S/ 3E- 34 1 S	--	7.6	265	22	4	30	1	0	121	12	14	3.0	0.4	0.06	22	156	72
11-20-63				1.10	0.33	1.30	0.03		1.98	0.25	0.39	0.06				165	
				40	12	47	1		74	9	15	2					
11S/ 3E- 7G 1 S	--	--	--	16	10	62	1	0	110	22	34	0.1	0.9	--	--		81
1- 4-61				0.80	0.82	2.70	0.03		1.80	0.46	0.96					200	
				18	19	62	1		56	14	30						
11S/ 3E-18P 1 S	--	7.4	280	24	7	30	3	0	120	6	22	20	0.1	0.06	38	210	89
11-20-63				1.20	0.58	1.30	0.08		1.97	0.12	0.62	0.32				209	
				38	18	41	3		65	4	20	11					
11S/ 4E-150 1 S	70	8.2	670	51	14	79	2	0	221	83	63	0	0.6	0.07	--	116	185
6-16-64				2.54	1.15	3.43	0.05		3.62	1.73	1.78					401	
				35	16	48	1		51	24	25						
11S/ 5E-18P 1 S	66	8.1	645	50	12	80	2	0	264	20	72	15	0.2	0.07	--	390	175
6-16-64				2.50	0.99	3.48	0.05		4.33	0.42	2.03	0.24				381	
				36	14	50	1		62	6	29	3					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million						
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃		
Date sampled																			
LOMA ALTA HYDRD SUBUNIT				CARLSBAD HYDRD UNIT														20400	
20440																			
115/ 4W-19H 1 S	68	7.7	2200	139	38	234	1	0	344	46	510	4.4	0.3	0.28	37		504		
10-19-55				6.94	3.13	10.17	0.03		5.64	0.96	14.38	0.07							
				34	15	50			27	5	68					1179			
115/ 4W-19H 2 S	--	8.5	1895	65	29	244	8	9	127	51	470	0.8	0.1	0.10	26	995	281		
12-20-57				3.24	2.38	10.61	0.20	0.30	2.08	1.06	13.25	0.01							
				20	14	65	1	2	12	6	79					965			
115/ 4W-21M 1 S	--	8.0	3436	232	66	420	1	0	376	103	950	7.4	0.7	0.44	42	2710	851		
6-18-64				11.58	5.43	18.26	0.03		6.16	2.14	26.79	0.12							
				33	15	52			17	6	76					2007			
VISTA HYDRD SUBUNIT				20480															
115/ 3W-17L 1 S	68	7.0	2183	139	135	135	3	0	339	247	416	89	0.4	0.12	70	1690	903		
6-18-64				6.94	11.10	5.87	0.08		5.56	5.14	11.73	1.44							
				29	46	24			23	22	49	6				1401			
115/ 3W-17P 1 S	68	7.4	1891	115	91	120	4	0	321	183	325	39	0.2	0.41	50	1261	662		
6-12-59				5.74	7.48	5.22	0.10		5.26	3.81	9.17	0.63							
				31	40	28	1		28	20	49	3				1085			
115/ 3W-19G 1 S	--	7.8	2232	159	127	150	2	0	324	137	570	56	0.2	0.10	--		919		
5-13-52				7.93	10.44	6.52	0.05		5.31	2.85	16.07	0.90							
				32	42	26			21	11	64	4				1361			
115/ 3W-19M 1 S	69	7.4	2180	153	110	177	1	0	436	249	423	20	0.1	0.26	43	1546	835		
10-29-63				7.63	9.05	7.70	0.03		7.15	5.18	11.93	0.32							
				31	37	32			29	21	49	1				1391			
115/ 3W-29G 1 S	--	8.3	1434	43	49	177	6	10	136	101	336	0	0	0.31	0	931	309		
6-12-59				2.15	4.03	7.70	0.15	0.33	2.23	2.10	9.48								
				15	29	55	1	2	16	15	67					789			
115/ 4W-24R 1 S	65	8.1	1934	133	116	150	2	0	351	123	485	21	0.2	0.10	--		810		
5-13-52				6.64	9.54	6.52	0.05		5.75	2.56	13.68	0.34							
				29	42	29			26	11	61	2				1203			
115/ 4W-25C 1 S	69	7.5	1550	80	56	129	4	0	283	79	294	4	0.3	0.07	35	989	430		
6-12-59				3.99	4.61	5.61	0.10		4.64	1.64	8.29	0.06							
				28	32	39	1		32	11	57					820			
115/ 4W-25E 1 S	--	7.5	1550	81	74	143	5	0	270	178	272	27	0.2	0.17	32	1042	507		
10-29-63				4.04	6.09	6.22	0.13		4.43	3.71	7.67	0.44							
				25	37	38	1		27	23	47	3				945			
115/ 4W-32C 1 S	--	7.2	2405	129	42	321	10	0	236	78	656	2.2	0.5	0.84	3		495		
9- 7-60				6.44	3.45	13.96	0.26		3.87	1.62	18.50	0.04				1660			
				27	14	58	1		16	7	77					1359			
115/ 4W-33F 1 S	--	7.9	2080	109	52	280	2	0	256	106	541	0	0.2	0.67	18	1336	486		
10-29-63				5.44	4.28	12.17	0.05		4.20	2.21	15.26								
				25	20	55			19	10	70					1235			
115/ 4W-33GS1 S	--	8.1	1513	65	43	185	3	0	207	69	357	2.5	0.6	0.34	43	950	339		
6-18-64				3.24	3.54	8.04	0.08		3.39	1.44	10.07	0.04							
				22	24	54	1		23	10	67					870			
125/ 5W- 1J 1 S	70	8.7	1450	49	21	281	30	10	32	393	266	2.3	0.3	0.10	14	1088	209		
9-14-56				2.45	1.73	12.22	0.77	0.33	0.52	8.18	7.50	0.04							
				14	10	71	4	2	3	49	45					1082			
AGUA NEULONIA HYDRD SUBUNIT				20400															
125/ 4W- 3R 1 S	--	8.4	1630	55	36	240	20	0	17	120	487	0	0.2	0.43	--	1080	294		
6-20-64				2.74	3.13	10.44	0.01		0.28	2.60	13.73								
				16	19	62	3		2	16	83					974			
125/ 4W- 9G 1 S	--	7.6	3058	142	62	390	3	0	395	249	680	2.5	0.7	0.08	35	1910	692		
6-17-64				7.09	6.74	16.96	0.08		6.47	5.18	19.16	0.04							
				23	22	55			21	17	62					1779			
125/ 4W-10U 1 S	68	7.9	2900	196	60	390	6	0	432	248	684	4.2	0.2	0.60	--	1726	769		
6-17-64				9.78	5.59	16.96	0.15		7.08	5.16	19.29	0.68							
				30	17	52			22	16	60	2				1847			
125/ 4W-10E 1 S	--	8.3	1808	107	49	200	4	7	288	66	420	4.9	0.8	0.28	21	1160	469		
6-10-64				5.34	4.03	8.70	0.10	0.23	4.72	1.37	11.84	0.08							
				29	22	46	1	1	26	8	65					1022			
125/ 4W-10G 1 S	72	8.0	1990	108	68	199	3	0	317	117	429	13	0.5	0.16	27	1137	549		
7-28-61				5.39	5.59	8.65	0.08		5.20	2.44	12.10	0.21							
				27	28	44			26	12	61	1				1120			
125/ 4W-10G 2 S	70	7.3	1968	121	57	210	6	0	325	133	426	1.5	0.6	0.56	41		537		
9- 7-60				6.04	4.69	9.13	0.15		5.33	2.77	12.07	0.02							
				30	23	46	1		26	14	60					1240			
																1158			

State well number	Temp. when	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
	samplerd in °F			Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date samplerd																	

AGUA MEDIONUA HYDRO SUBUNIT

Z14C

CARLSBAD HYDRO UNIT

Z0400

12S/ 4W-100 3 S	--	7.4	--	120	55	204	2	0	249	101	460	0	0.7	--	--	1215	546
10-8-59				6.37	4.52	8.01	0.05		4.08	2.10	12.77					1073	
				32	23	45			21	11	60						
12S/ 4W-10H 2 S	--	7.9	1100	67	20	115	5	0	145	312	57	1.0	0.1	0.13	10	140	532
7-25-62				4.34	2.30	5.00	0.13		2.30	6.50	2.17	0.02				726	
				37	20	42	4		20	56	24						
12S/ 4W-10H 5 S	--	7.3	2430	177	85	290	5	0	374	131	604	0	0.4	0.30	23	1760	764
10-29-63				8.83	6.03	12.61	0.00		6.46	2.73	10.12					1565	
				31	24	44			23	10	01						
12S/ 4W-10J 1 S	--	7.7	1025	92	55	225	2	0	260	113	432	0	0.2	0.45	22	1122	456
10-29-63				4.57	4.52	9.70	0.05		4.26	2.35	12.21					1070	
				24	24	52			23	12	65						
12S/ 4W-11E 1 S	70	8.3	1650	64	56	220	5	5	326	47	317	0	0.6	0.30	--	992	370
6-16-64				3.19	4.01	9.57	0.13	0.11	5.34	1.02	10.67					737	
				10	26	55	4		31	6	62						
12S/ 4W-11P 1 S	69	7.6	1730	70	62	200	3	0	276	62	424	0	0.4	0.31	--	1072	450
6-10-64				3.89	5.10	8.00	0.00		4.52	1.27	11.70					965	
				22	27	47			25	7	61						
12S/ 4W-15M 1 S	65	7.0	2754	176	77	294	13	0	34	602	424	5	2.1	1.20	--	1990	547
6-17-64				8.10	8.14	12.10	0.33		0.09	10.10	11.70	0.00				1843	
				27	21	45	4		3	50	40						
12S/ 4W-16J 1 S	72	7.2	1770	100	40	185	2	0	130	224	351	20	0.2	0.04	24	1090	437
4-11-62				4.77	3.70	8.04	0.05		2.26	4.60	9.70	0.32				1090	
				30	22	40			13	21	50	2				1021	

ENCINAS HYDRO SUBUNIT

Z0400

12S/ 4W-21B 1 S	--	8.2	2266	176	41	258	7	0	224	248	513	5	0.5	0.44	4		608
9-7-60				8.78	3.37	11.22	0.18		3.67	5.16	14.47	0.08				1600	
				37	14	40	1		16	22	62					1363	
12S/ 4W-21B 2 S	--	7.8	1981	182	29	178	5	0	246	281	357	0	0.6	0.26	20	1330	573
8-4-58				9.08	2.38	7.74	0.13		4.03	5.85	10.07					1174	
				47	12	40	1		20	29	50						
12S/ 4W-21E 1 S	59	7.8	3160	183	63	460	2	0	344	177	850	36.7	1.2	0.60	--		716
11-30-54				9.13	5.18	20.00	0.05		5.64	3.69	23.97	0.59				2190	
				27	15	58			17	11	71	2				1943	

SAN MARCOS HYDRO SUBUNIT

Z04E0

11S/ 3W-25N 2 S	68	7.0	1320	82	69	85	3	0	259	64	271	40	0.3	0.09	63	980	488
6-18-64				4.09	5.67	3.70	0.08		4.25	1.33	7.64	0.65				805	
				30	42	27	1		31	10	55	5					
12S/ 3W-12M 1 S	--	7.8	1720	82	57	101	3	0	259	42	262	26.6	0.4	0	--		439
8-3-55				4.09	4.69	4.39	0.08		4.25	0.87	7.39	0.43				848	
				31	35	33	1		33	7	57	3				701	
12S/ 3W-16L 1 S	--	7.2	8540	508	217	970	3	0	177	486	2548	19.2	0.3	0.10	--		2162
8-18-53				25.35	17.85	42.18	0.08		2.90	10.12	71.85	0.31				6412	
				30	21	49			3	12	84					4839	
12S/ 4W-26H 1 S	76	8.2	1400	46	30	215	2	0	221	92	297	0	0.6	0.33	26	788	239
10-30-63				2.30	2.47	9.35	0.05		3.62	1.92	8.38					818	
				16	17	66			26	14	60						
12S/ 4W-26N 1 S	--	7.2	2050	72	3	387	1	0	46	447	365	0	0.9	1.30	10		192
10-23-61				3.59	0.25	16.83	0.03		0.75	9.31	10.29					1436	
				17	1	81			4	46	51					1310	
12S/ 4W-26N 2 S	--	7.1	2100	31	6	444	4	0	49	458	385	0	0.8	1.50	10		102
10-23-61				1.55	0.49	19.31	0.10		0.80	9.54	10.86					1330	
				7	2	90			4	45	51					1364	
12S/ 4W-280 1 S	70	7.9	1900	10	1	430	2	0	102	24	606	0	0.2	0.89	--	1228	29
6-18-64				0.50	0.08	18.70	0.05		1.67	0.50	17.09					1124	
				3		97			9	3	89						
12S/ 4W-33P 1 S	70	7.3	2470	164	93	192	8	--	174	290	503	77	0.1	0.27	--		792
8-25-54				8.18	7.65	8.35	0.20		2.85	6.04	14.18	1.24				1810	
				34	31	34	1		12	25	58	5				1413	
12S/ 4W-34K 1 S	--	7.5	2240	122	50	294	3	0	378	176	466	14	0.8	0.48	30		510
4-26-61				6.09	4.11	12.78	0.08		6.20	3.66	13.14	0.23				1390	
				26	18	55			27	16	57	1				1342	
12S/ 4W-35L 1 S	70	7.8	2240	116	54	280	2	--	400	193	390	51	0.1	0.45	--	1358	512
8-25-54				5.79	4.44	12.17	0.05		6.56	4.02	11.00	0.82				1283	
				26	20	54			29	18	49	4					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value							Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂
Date sampled															

SAN MARCOS HYDRO SUBUNIT				Z04E0				CARLSBAD HYDRO UNIT				Z0400							
12S/ 4W-36C 1 S 7-27-61	72	8.0	1900	54 2.69 13	66 5.43 27	281 12.22 60	1 0.03	0	354 5.80 28	190 3.96 19	369 10.41 51	27 0.44 2	0.5	0.26	12	1053	406		
12S/ 4W-36E 1 S 7-27-61	74	7.8	3700	194 9.68 25	108 8.88 23	451 19.61 51	11 0.28 1	0	360 5.90 15	399 8.31 21	869 24.51 63	14 0.23 1	0.7	0.22	25	2362	929		
13S/ 4W- 2P 1 S 9-19-62	--	6.5	1200	76 3.79	44 3.62	120 5.22	--	0	78 1.28	232 4.83	180 5.08	--	--	0.50	50	812	371		
13S/ 4W- 2Q 1 S 6-18-64	--	6.9	1513	85 4.24 27	58 4.77 30	151 6.57 42	3 0.08 1	0	83 1.36 9	341 7.10 46	235 6.63 43	26 0.42 3	0.4	0.20	37	1090	451		
13S/ 4W-10K 1 S 9-25-62	--	6.8	1395	46 2.30	20 1.64	196 8.52	10 0.26	0	68 1.11	180 3.75	236 6.66	--	--	0.60	51	860	197		
13S/ 4W-11K 1 S 6-25-58	--	7.4	1090	53 2.64 26	24 1.97 19	125 5.44 53	11 0.28 3	--	105 1.72 17	190 3.96 39	153 4.31 42	17 0.27 3	0.4	--	40	665	231		
ESCONDIDO HYDRO SUBUNIT				Z04F0															
11S/ 1W-27F 1 S 6-17-64	65	7.8	570	38 1.90 32	18 1.48 25	59 2.57 43	1 0.03 1	0	188 3.08 51	38 0.79 13	72 2.03 34	6 0.10 2	0.2	0.05	--	358	169		
11S/ 1W-31P 2 S 1- 8-63	--	6.8	1166	80 3.99 36	32 2.63 24	102 4.43 40	2 0.05	0	224 3.67 33	99 2.06 19	181 5.10 46	17 0.27 2	0.7	0	62	747	331		
11S/ 1W-34G 1 S 6-17-64	64	8.0	440	25 1.25 27	10 0.82 18	57 2.48 54	1 0.03 1	0	129 2.11 48	25 0.52 12	51 1.44 32	23 0.37 8	0.4	0.05	--	282	104		
11S/ 2W-21K 1 S 1-10-63	--	6.9	1333	65 3.24 25	44 3.62 28	136 5.91 46	1 0.03	0	232 3.80 30	55 1.15 9	266 7.50 59	11 0.18 1	0.5	0.07	58	878	343		
11S/ 2W-33Q 1 S 1-10-63	--	7.3	1560	101 5.04 33	44 3.62 24	148 6.44 42	4 0.10 1	0	344 5.64 37	52 1.08 7	296 8.35 55	5.0 0.08 1	0.2	0.17	35	1048	433		
11S/ 2W-34F 1 S 1-24-63	--	7.0	--	61 3.04	24 1.97	120 5.22	--	0	268 4.39	63 1.31	180 5.08	--	--	0.30	50	692	251		
12S/ 2W- 2K 1 S 11- 8-63	--	7.6	2200	159 7.93 30	109 8.96 34	218 9.48 36	5 0.13	0	275 4.51 17	499 10.39 39	373 10.52 40	66 1.06 4	0.4	0.21	44	1808	845		
12S/ 2W- 2L 1 S 7-16-59	--	6.9	1653	120 5.99 36	50 4.11 25	145 6.30 38	6 0.15 1	0	278 4.56 27	203 4.23 25	254 7.16 43	47 0.76 5	0.4	0.34	30	1130	505		
12S/ 2W- 4P 3 S 11- 8-63	--	7.2	1470	96 4.79 34	41 3.37 24	137 5.96 42	5 0.13 1	0	220 3.61 26	110 2.29 16	259 7.30 52	53 0.85 6	0.2	0.18	34	964	408		
12S/ 2W- 9C 2 S 7-16-57	--	8.1	1226	82 4.09 33	33 2.71 22	127 5.52 44	7 0.18 1	0	148 2.43 19	336 7.00 55	113 3.19 25	0	0.2	0	6	851	340		
12S/ 2W- 9C 3 S 11- 8-63	--	7.2	940	76 3.79 38	22 1.81 18	100 4.35 43	4 0.10 1	0	182 2.98 30	173 3.60 36	117 3.30 33	7.8 0.13 1	0.2	0.18	16	680	280		
12S/ 2W- 9L 1 S 5- 3-51	--	--	1290	--	--	--	--	--	--	--	192 5.41	--	--	0.08	--				
12S/ 2W- 9P 1 S 7- 2-63	--	7.8	1655	78 3.89 20	73 6.00 30	227 9.87 50	2 0.05	0	354 5.80 30	160 3.33 17	351 9.90 51	24 0.39 2	0.9	0.05	37	1154	495		
12S/ 2W-10P 1 S 1- 9-63	--	7.4	1083	41 2.05 20	41 3.37 32	116 5.04 48	2 0.05	0	276 4.52 44	96 2.00 19	114 3.21 31	39 0.63 6	0.7	0.10	60	688	271		
12S/ 2W-11E 1 S 1- 9-63	--	7.4	1074	43 2.15 20	21 1.73 16	157 6.83 63	2 0.05	0	270 4.43 42	116 2.42 23	90 2.54 24	75 1.21 11	0.7	0	53	672	194		
12S/ 2W-11F 1 S 5- 3-51	--	--	874	--	--	--	--	--	--	--	86 2.43	--	--	0.03	--				

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

ESCONDIDO HYDRO SUBUNIT				CARLSBAD HYDRO UNIT										Z0400					
Z04F0																			
125/ 2W-110 1 S 5- 3-51	--	--	1404	--	--	--	--	--	--	--	241 6.80	--	--	0	--				
125/ 2W-12E 1 S 11- 8-63	--	7.6	1970	106 5.29 23	97 7.98 35	220 9.57 42	5 0.13 1	0	227 3.72 16	272 5.66 25	288 8.12 36	320 5.16 23	0.2	0.23	47	1596 1467	664		
125/ 2W-12E 2 S 11- 8-63	--	7.6	1300	54 2.69 20	45 3.70 27	165 7.17 53	1 0.03	0	284 4.65 35	87 1.81 14	224 6.32 47	38 0.61 5	0.1	0.19	31	858 785	320		
125/ 2W-13E 1 S 7- 3-63	69	7.9	667	38 1.90 28	25 2.06 31	63 2.74 41	2 0.05 1	0	156 2.56 39	40 0.83 13	90 2.54 39	35 0.56 9	0.5	0.03	49	421 419	198		
125/ 2W-13G 1 S 1- 9-63	--	7.3	1890	124 6.19 32	98 8.06 41	116 5.04 26	9 0.23 1	0	317 5.20 27	187 3.89 20	269 7.59 39	160 2.58 13	0.4	0.06	57	1161 1176	713		
125/ 2W-14A 1 S 5- 3-51	--	--	1838	--	--	--	--	--	--	--	322 9.08	--	--	0.05	--				
125/ 2W-14D 1 S 5- 3-51	--	--	1894	--	--	--	--	--	--	--	348 9.81	--	--	0.05	--				
125/ 2W-14E 1 S 8-11-60	--	7.4	--	76 3.79 26	40 3.29 23	170 7.39 51	2 0.05	0	294 4.82 38	99 2.06 16	197 5.58 44	9.3 0.15 1	0.3	--	--		354 738		
125/ 2W-14F 1 S 11- 8-63	--	7.5	940	46 2.30 24	33 2.71 28	104 4.52 47	4 0.10 1	0	182 2.98 31	63 1.31 14	177 4.59 52	19 0.31 3	0.2	0.13	45	658 581	251		
125/ 2W-14F 3 S 1- 8-63	--	7.1	1266	65 3.24 27	31 2.55 21	143 6.22 52	1 0.03	0	270 4.43 37	59 1.23 10	212 5.98 49	28 0.45 4	0.5	0.05	52	749 724	290		
125/ 2W-15E 1 S 10-19-62	--	7.1	1060	55 2.74 26	29 2.38 23	123 5.35 51	2 0.05	0	219 3.59 34	42 0.87 8	198 5.58 53	26 0.42 4	0.4	0.05	47	682 630	256		
125/ 2W-15F 1 S 5- 3-51	--	--	787	--	--	--	--	--	--	--	137 3.86	--	--	0	--				
125/ 2W-15J 1 S 6- 6-63	--	7.6	1220	65 3.24 27	35 2.88 24	137 5.96 49	2 0.05	0	292 4.79 40	72 1.50 12	180 5.08 42	41 0.66 5	0.5	0.11	44	708 720	306		
125/ 2W-16B 1 S 7- 2-63	--	7.9	1365	62 3.09 20	53 4.36 28	185 8.04 52	3 0.08 1	0	348 5.70 37	102 2.12 14	254 7.16 46	31 0.50 3	0.6	0.07	43	909 905	373		
125/ 2W-16N 1 S 6- 6-63	--	7.7	1618	63 3.14 19	45 3.70 22	220 9.57 58	6 0.15 1	0	273 4.47 27	202 4.21 26	226 6.37 39	60 1.29 8	0.5	0.08	65	1010 1042	342		
125/ 2W-17H 1 S 6-24-64	81	7.4	1670	87 4.34 24	75 6.17 35	165 7.17 40	6 0.15 1	0	224 3.67 20	317 6.60 36	181 5.10 28	173 2.79 15	0.2	0.08	--	1166 1114	526		
125/ 2W-17M 1 S 1- 9-63	--	7.2	1308	65 3.24 27	37 3.04 25	130 5.65 47	3 0.08 1	0	104 1.70 14	103 2.14 18	243 6.85 57	78 1.26 11	0.6	0.04	50	837 761	314		
125/ 2W-17M 2 S 6- 6-63	--	7.5	1188	51 2.54 22	39 3.21 28	129 5.81 49	4 0.10 1	0	154 2.61 24	70 1.46 13	208 5.87 53	70 1.13 10	0.7	0.72	48	713 699	288		
125/ 2W-18F 1 S 10-12-60	--	7.2	897	33 1.65 20	18 1.48 18	115 5.00 61	2 0.05 1	0	174 2.85 26	37 0.77 8	213 6.01 59	35 0.56 5	0.7	0.12	35	754 574	157		
125/ 2W-20G 1 S 6- 6-63	--	7.0	9000	650 32.44 33	435 35.77 37	660 28.70 29	15 0.38	0	556 9.11 9	249 5.18 5	2920 82.34 84	60 0.97 1	0.5	17.00	47	6600 5327	3413		
125/ 2W-20G 2 S 11- 8-63	--	7.1	8000	677 33.78 34	456 37.50 37	670 29.13 29	14 0.36	0	556 9.11 9	303 6.31 6	3018 85.11 85	9.3 0.15	0.1	0.20	15	6934 5436	3567		
125/ 2W-20H 1 S 11-16-60	--	7.8	2420	88 4.39 18	67 5.51 23	325 14.13 59	3 0.08	0	410 6.72 28	134 2.79 11	513 14.47 59	26 0.42 2	0.8	0.17	30	1366 1388	495		
125/ 2W-20H 2 S 5- 2-51	--	--	2488	--	--	--	--	--	--	--	521 14.69	--	--	0.09	--				

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date sampled																	

ESCONO100 HYDRO SUBUNIT				Z04F0				CARLSBAD HYDRO UNIT				Z0400							
12S/ 2W-20H 3 S	--	--	2294	--	--	--	--	--	--	--	--	485	--	--	0.09	--			
5- 2-51												13.68							
12S/ 2W-20H 4 S	--	7.5	6600	203	295	475	10	0	381	114	1968	53	0.1	0.20	36	4518	1721		
11-16-60				10.13	24.26	20.65	0.26		6.24	2.37	55.50	0.85							
				18	44	37			10	4	85	1				3342			
12S/ 2W-20H 5 S	64	7.6	3368	95	103	511	1	0	666	162	698	98	1.1	0.19	31	2095	661		
11-16-60				4.74	8.47	22.22	0.03		10.92	3.37	19.68	1.58							
				13	24	63			31	9	55	4				2028			
12S/ 2W-20J 1 S	--	--	2222	--	--	--	--	--	--	--	457	--	--	0.10	--				
5- 2-51											12.89								
12S/ 2W-20J 2 S	--	--	2315	--	--	--	--	--	--	--	490	--	--	0.14	--				
5- 2-51											13.82								
12S/ 2W-20J 3 S	--	--	3289	--	--	--	--	--	--	--	770	--	--	0.12	--				
5- 2-51											21.71								
12S/ 2W-20J 4 S	--	--	2849	--	--	--	--	--	--	--	625	--	--	0.10	--				
5- 2-51											17.63								
12S/ 2W-20J 5 S	--	7.1	4665	200	174	531	7	0	329	185	1290	110	0.5	0.21	45	3190	1215		
6- 6-63				9.98	14.31	23.09	0.18		5.39	3.85	36.38	1.77							
				21	30	49			11	8	77	4				2704			
12S/ 2W-20J 6 S	--	--	4348	--	--	--	--	--	--	--	1210	--	--	0.10	--				
5- 2-51											34.12								
12S/ 2W-20J 7 S	--	--	2604	--	--	--	--	--	--	--	540	--	--	0.18	--				
5- 3-51											15.23								
12S/ 2W-20J 9 S	--	7.4	2994	118	92	388	4	0	405	133	720	35	0.7	0.21	41	1855	674		
6- 6-63				5.89	7.57	16.87	0.10		6.64	2.77	20.30	0.56							
				19	25	55			22	9	67	2				1731			
12S/ 2W-20J10 S	--	7.5	3395	102	85	525	5	0	706	216	908	15	0.6	0.30	21	2064	604		
10-12-60				5.09	6.99	22.83	0.13		11.57	4.50	25.61	0.24							
				15	20	65			28	11	61	1				2225			
12S/ 2W-20K 1 S	--	7.2	7400	593	404	605	12	0	580	231	2681	5.1	0.1	5.00	33	4980	3143		
11- 8-63				29.59	33.22	26.31	0.31		9.51	4.81	75.60	0.08							
				33	37	29			11	5	84					4854			
12S/ 2W-20K 2 S	--	7.3	1035	64	35	75	4	0	85	65	172	96	0.5	0.02	52	758	304		
4-25-62				3.19	2.88	3.26	0.10		1.39	1.35	4.85	1.55							
				34	31	35	1		15	15	53	17				605			
12S/ 2W-20K 3 S	--	6.5	13568	970	795	940	16	0	361	139	5120	80	0.6	1.80	44	9720	5694		
6- 6-63				48.40	65.38	40.87	0.41		5.92	2.89	144.38	1.29							
				31	42	26			4	2	93	1				8284			
12S/ 2W-20K 4 S	--	6.8	1330	93	56	97	4	0	79	102	286	116	0.2	0.27	40	1042	463		
11- 8-63				4.64	4.61	4.22	0.10		1.29	2.12	8.07	1.87							
				34	34	31	1		10	16	60	14				833			
12S/ 2W-20Q 1 S	--	7.7	2250	79	51	341	4	0	433	303	355	0	1.2	0.65	37	1398	407		
11-15-60				3.94	4.19	14.83	0.10		7.10	6.31	10.01								
				17	18	64			30	27	43					1385			
12S/ 2W-20Q 2 S	--	7.1	3061	146	79	420	17	0	417	432	535	24	0.7	0.97	50	1937	690		
6- 6-63				7.29	6.50	18.26	0.43		6.83	8.99	15.09	0.39							
				22	20	56	1		22	29	48	1				1910			
12S/ 2W-20R 1 S	--	7.3	1965	130	89	120	4	0	199	216	308	189	0.3	0.08	35	1212	691		
11-15-60				6.49	7.32	5.22	0.10		3.26	4.50	8.69	3.05							
				34	38	27	1		17	23	45	16				1189			
12S/ 2W-210 1 S	--	--	1637	--	--	--	--	--	--	--	328	--	--	0.07	--				
5- 3-51											9.25								
12S/ 2W-210 2 S	--	7.8	2000	70	57	330	2	0	443	238	334	24	0.6	0.40	31	1138	409		
11- 8-63				3.49	4.69	14.35	0.05		7.26	4.96	9.42	0.39							
				15	21	64			33	23	43	2				1305			
12S/ 2W-21E 1 S	78	7.7	2200	156	99	200	10	0	381	151	522	3	0.2	0.20	28		797		
9-12-56				7.78	8.14	8.70	0.26		6.24	3.14	14.72	0.05				1560			
				31	33	35	1		26	13	61					1357			
12S/ 2W-21M 1 S	--	7.6	2125	94	58	287	5	0	531	134	362	34	1.0	0.49	46	1290	473		
8-17-60				4.69	4.77	12.48	0.13		8.70	2.79	10.21	0.55							
				21	22	57	1		39	13	46	2				1282			

State well number	Temp. when	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
	sampled in °F			Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date sampled																	

ESCONDIDO HYORO SUBUNIT				CARLSBAU HYURO UNIT									Z0400					
204F0																		
125/ 2W-21M 3 S	--	7.3	1960	150	74	160	5	0	223	102	507	12	0.5	0.03	37	1554	680	
7- 3-63				7.49	6.09	6.96	0.13		3.65	2.12	14.30	0.19						
				36	29	34	1		18	10	71	1				1157		
125/ 2W-21M 4 S	--	--	1961	--	--	--	--	--	--	--	420	--	--	0.18	--			
5- 3-51											11.84							
125/ 2W-22J 1 S	--	7.7	1890	125	125	153	3	0	287	338	332	119	0.5	0.03	56	1489	827	
7- 2-63				6.24	10.28	6.65	0.08		4.70	7.04	9.36	1.92						
				27	44	29			20	31	41	8				1393		
125/ 2W-28H 1 S	71	7.6	1140	74	47	115	4	0	235	127	174	68	0.5	0.02	43	779	378	
7- 2-63				3.69	3.87	5.00	0.10		3.85	2.64	4.91	1.10						
				29	31	39	1		31	21	39	9				768		
125/ 2W-30N 1 S	--	7.6	1800	108	39	240	4	0	302	240	338	0	0.2	0.40	30	1250	430	
10-18-62				5.39	3.21	10.44	0.10		4.95	5.00	9.53							
				28	17	55	1		25	26	49					1148		
125/ 2W-31D 1 S	--	7.1	2400	176	79	270	2	0	397	298	494	0	0.2	0.48	30	1748	765	
10-18-62				8.78	6.50	11.74	0.05		6.51	6.20	13.93							
				32	24	43			24	23	52					1545		
135/ 3W- 5P 1 S	--	7.8	5600	417	202	675	6	0	428	889	1434	3.0	1.0	0.30	17	4593	1872	
10-16-62				20.81	16.61	29.35	0.15		7.01	18.51	40.44	0.05						
				31	25	44			11	28	61					3855		
135/ 3W- 7R 1 S	--	7.5	2500	174	98	290	3	0	498	330	494	0	0.4	0.38	16	1774	838	
10-16-62				8.68	8.06	12.61	0.08		8.16	6.87	13.93							
				29	27	43			28	24	48					1651		
135/ 3W- 9E 1 S	--	8.3	1020	45	48	117	1	4	342	89	59	120	0.2	0.20	22	692	310	
12-19-63				2.25	3.95	5.09	0.03	0.13	5.61	1.85	1.66	1.94						
				20	35	45		1	50	17	15	17				674		
135/ 3W-160 1 S	--	7.0	4400	609	164	385	2	0	233	1696	751	0	0.8	0.20	26	4216	2196	
10-18-62				30.39	13.49	16.74	0.05		3.82	35.31	21.18							
				50	22	28			6	59	35					3749		
135/ 3W-16H 1 S	--	7.4	2300	105	66	295	3	0	276	173	558	0	0.4	0.28	23	1594	534	
10-17-62				5.24	5.43	12.83	0.08		4.52	3.60	15.74							
				22	23	54			19	15	66					1359		
135/ 3W-188 1 S	70	7.9	1710	81	54	179	1	0	346	130	291	1.2	0.3	0.28	--		424	
8-25-54				4.04	4.44	7.78	0.03		5.67	2.71	8.21	0.02				1008		
				25	27	48			34	16	49					908		
135/ 3W-188 2 S	--	7.0	2800	188	105	325	2	0	451	375	616	0	0.2	0.40	21	2180	902	
10-16-62				9.38	8.64	14.13	0.05		7.39	7.81	17.37							
				29	27	44			23	24	53					1854		
135/ 3W-19D 1 S	--	7.4	3600	174	84	562	14	0	575	437	760	36	1.0	0.63	29	2498	780	
10-16-62				8.68	6.91	24.44	0.36		9.42	9.10	21.43	0.58						
				21	17	61	1		23	22	53	1				2380		
135/ 3W-19D 2 S	--	7.6	2800	98	64	450	59	0	464	267	609	37	1.0	0.50	27	1838	508	
10-16-62				4.89	5.26	19.57	1.51		7.60	5.56	17.17	0.60						
				16	17	63	5		25	18	56	2				1841		
135/ 4W-23H 1 S	--	7.0	2700	136	81	350	5	0	205	395	613	7	0.8	0.43	--	1842	673	
6-26-64				6.79	6.66	15.22	0.13		3.36	8.22	17.29	0.11						
				24	23	53			12	28	60					1689		
135/ 4W-24N 1 S	--	7.0	2100	127	46	280	2	0	227	405	361	22.0	0.4	0.40	45	1574	506	
10-16-62				6.34	3.78	12.17	0.05		3.72	8.49	10.16	0.35						
				28	17	54			16	37	45	2				1403		
135/ 4W-24P 1 S	72	7.7	2213	71	2	373	6	0	39	254	505	2.5	2.1	3.20	--	1191	185	
3-10-64				3.54	0.16	16.22	0.15		0.64	5.29	14.24	0.04						
				18	1	81	1		3	26	70					1238		
135/ 4W-25C 1 S	--	7.4	4500	204	77	737	8	0	274	419	1265	6.0	1.0	1.58	23	3174	826	
10-16-62				10.18	6.33	32.04	0.20		4.49	8.72	35.67	0.10						
				21	13	66			9	18	73					2876		
135/ 4W-25J 1 S	--	8.0	3450	190	81	490	6	0	252	400	886	1.8	0.4	1.00	28	2462	808	
12-18-63				9.48	6.66	21.31	0.15		4.13	8.33	24.99	0.03						
				25	18	57			11	22	67					2208		
135/ 4W-25O 1 S	--	8.2	2300	65	7	500	4	0	41	272	630	81	2.0	0.45	12	1384	191	
2- 8-63				3.24	0.58	21.74	0.10		0.67	5.66	17.77	1.31						
				13	2	85			3	22	70	5				1594		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed
Date sampled																

SAN DIEGUITO HYDRO SUBUNIT				Z05A0				SAN DIEGUITO HYDRO UNIT										Z0500			
135/ 3W-23L 1 S	--	7.7	3900	364	41	456	6	0	31	1300	460	0	8.0	0.42	3	2700	1077				
3-27-57				18.16	3.37	19.83	0.15		0.51	27.07	12.97										
				44	8	48			1	67	32					2654					
135/ 3W-24R 1 S	69	7.5	2395	83	48	334	4	0	256	115	575	0	1.0	0.18	23	1400	405				
3-12-57				4.14	3.95	14.52	0.10		4.20	2.39	16.22										
				18	17	64			18	10	71					1309					
135/ 3W-28N 1 S	--	7.3	1773	116	59	157	3	0	268	104	380	1.1	0.4	0.05	37	974	532				
1- 3-62				5.79	4.85	6.83	0.08		4.39	2.17	10.72	0.02									
				33	28	39			25	13	62					989					
135/ 3W-28N 2 S	--	7.5	1525	120	50	150	3	0	275	167	314	0.0	0.2	0.15	--	942	505				
3-26-65				5.99	4.11	6.52	0.08		4.51	3.48	8.85										
				36	25	39			27	21	53					940					
135/ 3W-28P 1 S	--	7.6	1128	60	35	109	0	0	244	68	177	15.0	0.3	0.25	--	637	294				
3-26-57				2.99	2.88	4.74			4.00	1.42	4.99	0.24									
				28	27	45			38	13	47	2				584					
135/ 3W-32J 1 S	--	7.8	1485	90	43	134	7	0	180	339	151	3.9	0.6	0.13	--	930	402				
3-26-57				4.49	3.54	5.83	0.18		2.95	7.06	4.26	0.06									
				32	25	42	1		21	49	30					857					
135/ 3W-32R 1 S	70	7.9	1900	117	59	250	8	0	431	226	357	3	0.2	0.26	--	1290	535				
3- 4-65				5.84	4.85	10.87	0.20		7.06	4.71	10.07	0.05									
				27	22	50	1		32	22	46					1232					
135/ 3W-33B 1 S	--	7.5	1645	98	67	165	5	0	211	153	387	0.0	0.2	0.20	--	1246	520				
3- 4-65				4.89	5.51	7.17	0.13		3.46	3.19	10.91										
				28	31	41	1		20	18	62					979					
135/ 3W-33C 6 S	--	7.1	1989	122	68	102	--	0	268	390	340	--	--		0	16	1362	584			
4-16-62				6.09	5.59	4.43			4.39	8.12	9.59										
135/ 3W-330 1 S	68	7.8	2200	124	60	320	8	0	318	456	353	0.0	0.2	0.21	--	1558	556				
3-25-65				6.19	4.93	13.91	0.20		5.21	9.49	9.95										
				25	20	55	1		21	38	40					1478					
135/ 3W-33E 2 S	68	7.9	2500	196	62	335	8	0	361	356	564	0.0	0.4	0.29	--	1786	745				
3- 4-65				9.78	5.10	14.57	0.20		5.92	7.41	15.90										
				33	17	49	1		20	25	54					1699					
135/ 3W-33F 2 S	66	7.4	1900	140	68	136	1	0	223	210	372	2.9	0.2	0.12	--	1190	630				
3-26-57				6.99	5.59	5.91	0.03		3.65	4.37	10.49	0.05									
				38	30	32			20	24	57					1040					
135/ 3W-33F 3 S	--	7.3	2500	196	87	186	5	0	207	251	568	0	0.5	0.06	29	1580	847				
11-15-62				9.78	7.15	8.09	0.13		3.39	5.23	16.02										
				39	28	32	1		14	21	65					1424					
135/ 3W-33F 4 S	69	7.7	3000	285	119	270	18	0	288	394	808	2	0.2	0.11	--	2350	1201				
3- 4-65				14.22	9.79	11.74	0.46		4.72	8.20	22.79	0.03									
				39	27	32	1		13	23	64					2038					
135/ 3W-33L 3 S	--	7.5	2560	214	98	272	16	0	337	397	599	0.0	0.1	0.15	--	1738	938				
3-25-65				10.68	8.06	11.83	0.41		5.52	8.27	16.89										
				34	26	38	1		18	27	55					1762					
135/ 3W-33L 6 S	--	7.7	1950	146	55	217	8	0	423	203	361	0.0	0.2	0.25	--	1250	591				
3- 4-65				7.29	4.52	9.44	0.20		6.93	4.23	10.18										
				34	21	44	1		32	20	48					1198					
135/ 3W-33M 1 S	67	7.8	3514	18	9	132	71	0	1830	1	184	3.1	0.4	0.20	--	560	82				
3- 6-64				0.90	0.74	5.74	1.82		29.99	0.02	5.19	0.05									
				10	8	62	20		85		15					1319					
135/ 3W-330 1 S	--	7.3	6200	429	184	1005	43	0	379	681	2089	0.0	0.4	0.53	--	4420	1828				
3-25-65				21.41	15.13	43.70	1.10		6.21	14.18	58.91										
				26	19	54	1		8	18	74					4618					
135/ 3W-330 3 S	66	7.5	3000	52	58	595	22	0	110	145	1011	0.0	0.2	0.26	--	1956	368				
3- 4-65				2.59	4.77	25.87	0.56		1.80	3.02	28.51										
				8	14	77	2		5	9	86					1937					
135/ 3W-34K 1 S	--	7.5	11890	974	364	1500	10	0	207	2106	3400	7.5	1.5	0.88	12	10460	3930				
1-11-63				48.60	29.94	65.22	0.26		3.39	43.85	95.88	0.12									
				34	21	45			2	31	67					8478					
145/ 3W- 20 1 S	--	7.2	1110	68	24	125	3	0	152	115	221	0	0.4	0.20	22	702	268				
8-10-62				3.39	1.97	5.44	0.08		2.49	2.39	6.23										
				31	18	50	1		22	22	56					653					
145/ 3W- 20 2 S	--	7.2	8696	637	464	800	2	0	388	1534	2300	0	1.2	0.54	24		3500				
1-10-63				31.79	38.16	34.78	0.05		6.36	31.94	64.86										
				30	36	33			6	31	63					7545					
																5953					
145/ 3W- 30 1 S	--	7.2	6200	611	216	780	7	0	251	898	2089	0.0	0.6	0.77	--	5160	2414				
3- 4-65				30.49	17.76	33.91	0.18		4.11	18.70	58.91										
				37	22	41			5	23	72					4726					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃

SAN DIEGUITO HYDRO SUBUNIT				SAN DIEGUITO HYDRO UNIT								20500					
145/ 3W- 4N 1 S -- 7.7 2700	222	86	285	3	0	269	301	684	7	0.4	0.40	--	2010	908			
3- 4-65	11.08	7.07	12.39	0.08		4.41	6.27	19.29	0.11								1721
	36	23	40			15	21	64									
145/ 3W- 4P 1 S -- 7.2 4400	477	141	420	2	0	332	664	1181	18	0.2	0.37	--	3600	1771			
3- 4-65	23.80	11.60	18.26	0.05		5.44	13.82	33.30	0.29								3067
	44	22	34			10	26	63	1								
145/ 3W- 5F 1 S -- 7.5 3000	152	85	515	41	0	553	800	442	0.0	1.0	0.63	--	2196	729			
3-19-65	7.58	6.99	22.39	1.05		9.06	16.66	12.46									2309
	20	18	59	3		24	44	33									
145/ 3W- 5K 2 S -- 7.5 5000	325	106	730	33	0	243	573	1450	0.0	0.1	0.87	--	3610	1248			
3- 3-65	16.22	8.72	31.74	0.84		3.98	11.93	40.89									3337
	28	15	55	1		7	21	72									
145/ 3W- 5N 1 S -- 7.8 3000	108	33	570	31	0	480	210	762	0.0	0.2	0.80	--	1848	405			
3-19-65	5.39	2.71	24.78	0.79		7.87	4.37	21.49									1951
	16	8	74	2		23	13	64									
145/ 3W- 6P 1 S -- 8.0 12400	273	224	3400	70	0	1479	889	4820	2	0.1	3.50	--	9408	1603			
3-18-65	13.62	18.42	147.83	1.79		24.24	18.51	135.92	0.03								10409
	7	10	81	1		14	10	76									
145/ 3W- 6P 2 S 66 7.4 3360	100	56	513	9	0	336	246	775	6.5	0.6	0.63	--	1960	480			
3-26-57	4.99	4.61	22.31	0.23		5.51	5.12	21.86	0.10								1872
	16	14	69	1		17	16	67									
145/ 3W- 7C 1 S 70 8.0 7700	291	96	1700	23	0	1170	877	2163	0	1.0	2.60	26	5708	1122			
11-12-62	14.52	7.90	73.92	0.59		19.18	18.26	61.00									5755
	15	8	76	1		19	19	62									
145/ 3W- 7C 2 S 64 7.8 11100	294	298	1918	43	0	782	788	3320	9.3	1.0	1.40	--	7501	1961			
3-11-64	14.67	24.51	83.39	1.10		12.82	16.41	93.62	0.15								7057
	12	20	67	1		10	13	76									
145/ 3W- 7C 3 S -- 7.7 8000	206	133	1820	50	0	964	610	2550	2	0.4	1.85	--	5620	1062			
2-26-65	10.28	10.94	79.13	1.28		15.80	12.70	71.91	0.03								5847
	10	11	78	1		16	13	72									
145/ 3W- 7C 4 S 60 7.5 9450	204	153	1890	47	0	1066	703	2645	7	1.2	2.04	29	6665	1139			
2- 1-62	10.18	12.58	82.18	1.20		17.47	14.64	74.59	0.11								6205
	10	12	77	1		16	14	70									
145/ 3W- 7C 6 S 68 8.2 9200	164	129	2250	75	0	1027	832	3041	0.0	0.8	2.00	--	7102	940			
3-18-65	8.18	10.61	97.83	1.92		16.83	17.32	85.76									6999
	7	9	83	2		14	14	72									
145/ 3W- 7E 1 S -- 7.5 5310	73	61	968	8	0	665	272	1262	12.8	0.8	1.25	--	3081	433			
3-26-57	3.64	5.02	42.09	0.20		10.90	5.66	35.59	0.21								2986
	7	10	83			21	11	68									
145/ 3W- 7E 2 S 68 7.5 5000	170	109	980	20	0	228	724	1450	0.0	0.8	3.50	--	3610	873			
3-17-65	8.48	8.96	42.61	0.51		3.74	15.07	40.89									3569
	14	15	70	1		6	25	68									
145/ 3W- 7J 1 S -- 7.7 725	54	16	88	1	0	215	60	103	4	0.2	0.28	--	440	201			
3- 1-65	2.69	1.32	3.83	0.03		3.52	1.25	2.90	0.06								432
	34	17	49			46	16	38	1								
145/ 3W- 7K 1 S -- 7.4 2650	218	60	285	6	0	296	478	455	0	0.6	0.20	25	1750	791			
3-26-57	10.88	4.93	12.39	0.15		4.85	9.95	12.83									1673
	33	17	44	1		18	36	46									
145/ 3W- 7L 1 S -- 8.0 2225	196	35	305	6	0	81	145	741	1	0.1	0.25	--	1496	634			
3-24-65	9.78	2.88	13.26	0.15		1.33	3.02	20.90	0.02								1469
	38	11	51	1		5	12	83									
145/ 3W- 7L 4 S -- 7.4 2450	214	63	280	8	0	300	478	486	0.0	0.4	0.50	--	1820	794			
3- 1-65	10.68	5.18	12.17	0.20		4.92	9.95	13.71									1677
	38	18	43	1		17	35	48									
145/ 3W- 7L 5 S -- 7.2 2800	341	70	263	7	0	309	631	560	0.0	0.4	0.48	--	2190	1140			
3- 1-65	17.02	5.76	11.44	0.18		5.06	13.14	15.79									2025
	49	17	33	1		15	39	46									
145/ 3W- 7M 1 S -- 7.4 2960	54	43	506	3	0	317	310	615	0	2.0	0.34	16	1810	312			
3-26-57	2.69	3.54	22.00	0.08		5.20	6.45	17.34									1705
	10	13	78			18	22	60									
145/ 3W- 7M 3 S 62 8.0 3500	222	115	545	38	0	377	514	972	6	1.0	1.00	--	2758	1028			
3- 1-65	11.08	9.46	23.70	0.97		6.18	10.70	27.41	0.10								2599
	25	21	52	2		14	24	62									
145/ 3W- 7P 1 S -- 7.8 1950	118	32	300	12	0	190	121	568	1	0.1	0.50	--	1450	426			
3- 1-65	5.89	2.63	13.04	0.31		3.11	2.52	16.02	0.02								1246
	27	12	60	1		14	12	74									
145/ 3W- 7P 4 S -- 7.4 1925	174	43	190	5	0	91	91	571	11	0.2	0.28	--	1490	611			
3- 2-65	8.68	3.54	8.26	0.13		1.49	1.89	16.10	0.18								1130
	42	17	40	1		8	10	82	1								

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	Evap 180°C Computed	TDS Evap 105°C	Total hardness as CaCO ₃

SAN DIEGUITO HYDRO SUBUNIT				SAN DIEGUITO HYDRO UNIT									Z0500					
145/ 3W- 7P 6 S 3- 2-65	--	7.9	1900	120 5.99 28	58 4.77 23	230 10.00 47	14 0.36 2	0	348 5.70 27	199 4.14 20	390 11.00 53	0.0	0.1	0.45	--	1236	538	1183
145/ 3W- 8M 1 S 3-26-57	66	7.3	915	65 3.24 36	20 1.64 18	91 3.96 45	2 0.05 1	0	223 3.65 42	54 1.12 13	140 3.95 45	3.8 0.06 1	0.6	0.10	27	588	244	513
145/ 3W- 8M 2 S 3- 1-65	--	7.0	425	19 0.95 20	6 0.49 10	74 3.22 69	1 0.03 1	0	84 1.38 30	25 0.52 11	80 2.26 50	24 0.39 9	0.2	0.17	--	304	72	271
145/ 3W-10B 1 S 3-27-58	60	8.1	4016	239 11.93 28	77 6.33 15	545 23.70 56	6 0.15	0	309 5.06 12	688 14.32 34	785 22.14 53	0.5 0.01	0.5	0.72	10	2670	914	2504
145/ 3W-17C 2 S 8-23-62	68	7.7	2000	79 3.94 18	21 1.73 8	363 15.78 73	4 0.10	0	281 4.61 22	296 6.16 29	372 10.49 49	0	0.6	1.13	14	1280	284	1289
145/ 4W- 1K 1 S 2-25-65	70	7.6	2250	132 6.59 27	9 0.74 3	394 17.13 69	9 0.23 1	0	111 1.82 7	297 6.18 25	577 16.27 67	0.0	0.8	2.46	--	1474	367	1476
145/ 4W- 1P 1 S 8- 4-59	--	8.0	2350	161 8.03 19	74 6.09 15	632 27.48 66	12 0.31 1	0	204 3.34 8	388 8.08 19	1065 30.03 71	60 0.97 2	0.7	0.44	28	1677	707	2521
145/ 4W- 1P 2 S 3-25-57	--	7.3	5570	197 9.83 18	170 13.98 25	718 31.22 56	12 0.31 1	0	143 2.34 4	730 15.20 27	1397 39.40 69	8.5 0.14	0.8	2.00	--	3665	1191	3306
145/ 4W- 10 1 S 3-24-65	--	7.3	19500	942 47.01 16	287 23.60 8	5100 221.75 75	120 3.07 1	0	138 2.26 1	1436 29.90 10	9170 258.59 89	0.0	0.8	5.25	--	17400	3533	17129
145/ 4W- 1R 4 S 3-17-65	70	7.4	4500	375 18.71 32	32 2.63 4	835 36.31 62	35 0.89 2	0	137 2.25 4	842 17.53 30	1344 37.90 66	0.0	1.0	2.26	--	3482	1068	3534
145/ 4W-11J 2 S 2-25-65	--	7.9	28000	3186 158.98 39	294 24.18 6	5200 226.10 55	70 1.79	0	64 1.05	1340 27.90 7	13634 384.48 93	0.0	0.1	12.70	--	27402	9165	23768
145/ 4W-12B 1 S 8-21-63	--	8.5	8300	111 5.54 6	141 11.60 13	1675 72.83 80	43 1.10 1	9 0.30	107 1.75 2	600 12.49 14	2695 76.00 84	0	0.6	1.47	21	5240	858	5350
145/ 4W-12H 1 S 3-17-65	68	4.4	25000	393 19.61 6	550 45.23 14	6020 261.75 79	140 3.58 1	0	0	2536 52.80 16	9750 274.95 84	0.0	0.4	3.82	--	19360	3245	19393
145/ 4W-12L 1 S 11-14-62	68	7.9	6700	326 16.27 19	34 2.80 3	1450 63.05 75	58 1.48 2	0	416 6.82 8	7 0.15	2669 75.27 92	0	0.2	1.00	2	5410	954	4752
125/ 2W-24F 2 S 3-26-57	68	7.3	1302	97 4.84 33	66 5.43 37	104 4.52 30	3 0.08 1	--	243 3.98 27	209 4.35 30	163 4.60 31	109.7 1.77 12	0.2	0.10	60	934	514	931
125/ 2W-24R 3 S 3-26-57	62	7.8	1197	47 2.35 20	49 4.03 35	120 5.22 45	1 0.03	0	172 2.82 24	167 3.48 29	141 3.98 34	95.4 1.54 13	0.6	0.10	60	821	319	766
125/ 2W-26H 3 S 3-26-57	68	7.3	1035	57 2.84 28	38 3.13 31	92 4.00 40	4 0.10 1	0	192 3.15 32	131 2.73 28	110 3.10 31	55 0.89 9	0.4	0.10	32	660	299	614
125/ 2W-26J 2 S 3-26-57	65	7.1	1067	59 2.94 28	36 2.96 28	107 4.65 44	3 0.08 1	0	234 3.84 37	119 2.48 24	115 3.24 31	49 0.79 8	0.4	0	50	672	295	653
125/ 2W-26P 2 S 3- 5-57	68	7.2	1360	86 4.29 33	52 4.28 32	104 4.52 34	4 0.10 1	0	241 3.95 31	110 2.29 18	158 4.46 35	130 2.10 16	0.2	0	26	880	429	791
125/ 2W-27J 2 S 4- 8-57	70	7.3	1635	100 4.99 32	65 5.35 34	121 5.26 33	7 0.18 1	0	265 4.34 28	104 2.17 14	260 7.33 48	91 1.47 10	0.5	0	30	1000	517	909
125/ 2W-27N 3 S 4- 8-57	70	7.2	760	37 1.85 25	24 1.97 27	81 3.52 48	2 0.05 1	0	125 2.05 28	74 1.54 21	105 2.96 41	46 0.74 10	0.7	0.02	37	480	191	468
125/ 2W-330 1 S 6-24-64	--	7.4	840	35 1.75 22	35 2.88 36	77 3.35 41	5 0.13 2	0	206 3.38 41	36 0.75 9	142 4.00 49	6 0.10 1	0.2	0.08	--	468	232	437

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value							Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂
Date sampled															

HODGES HYDRO SUBUNIT				SAN DIEGUITO HYDRO UNIT														
				Z0580					Z0500									
12S/ 2W-34M 2 S	69	7.6	960	56	30	89	4	0	177	54	145	62	0.7	0	33	600	263	
4- 8-57				2.79	2.47	3.87	0.10		2.90	1.12	4.09	1.00						
				30.	27	42	1		32	12	45	11				561		
13S/ 2W- 1J 1 S	68	7.1	1310	95	45	102	2	0	275	208	152	0	0.7	0	28	866	422	
4- 5-57				4.74	3.70	4.43	0.05		4.51	4.33	4.29							
				37	29	34			34	33	33					768		
13S/ 2W- 1R 1 S	--	7.7	853	83	31	75	5	0	264	140	93	2.0	0.8	0.10	--		335	
7-10-53				4.14	2.55	3.26	0.13		4.33	2.91	2.62	0.03				587		
				41	25	32	1		44	29	26					560		
13S/ 2W- 1R 2 S	66	7.1	2052	278	40	185	4	0	310	543	319	1.3	0.1	0.32	30	1596	859	
11-19-63				13.87	3.29	8.04	0.10		5.08	11.31	9.00	0.02						
				55	13	32			20	45	35					1553		
13S/ 2W- 2052 S	57	8.2	1740	96	49	171	3	0	308	185	266	17.8	0.5	0.08	--	1027	441	
2-15-57				4.79	4.03	7.44	0.08		5.05	3.85	7.50	0.29						
				29	25	46			30	23	45	2				940		
13S/ 2W- 2053 S	57	8.2	41740	111	61	161	1	0	336	176	278	43.9	0.5	0.12	--	1093	528	
2-15-57				5.54	5.02	7.00	0.03		5.51	3.66	7.84	0.71						
				31	29	40			31	21	44	4				998		
13S/ 2W- 2L 1 S	67	7.6	820	43	27	73	3	0	143	27	153	21	0.4	0	31	498	219	
4- 5-57				2.15	2.22	3.17	0.08		2.34	0.56	4.31	0.34						
				28	29	42	1		31	7	57	5				449		
13S/ 2W-11R 1 S	71	7.1	1453	112	54	121	4	0	321	212	208	1.3	0.2	0.22	24		502	
8-18-60				5.59	4.44	5.26	0.10		5.26	4.41	5.87	0.02				1038		
				36	29	34	1		34	28	38					895		
13S/ 2W-12L 1 S	70	7.0	1450	94	46	146	3	0	267	166	242	3.4	0.4	0.19	30		424	
7-20-61				4.69	3.78	6.35	0.08		4.38	3.46	6.82	0.05				926		
				31	25	43	1		30	24	46					862		
13S/ 2W-12N 1 S	68	7.5	1010	67	34	127	4	0	250	110	181	0	0.4	0.20	33	696	307	
11-19-63				3.34	2.80	5.52	0.10		4.10	2.29	5.10							
				28	24	47	1		36	20	44					680		
13S/ 2W-12N 6 S	72	7.3	1256	64	34	137	6	0	226	78	243	4	0.6	0.22	27		300	
8-18-60				3.19	2.80	5.96	0.15		3.70	1.62	6.85	0.06				848		
				26	23	49	1		30	13	56					705		
SAN PASQUAL HYDRO SUBUNIT				Z05C0														
12S/ 1W- 5N 1 S	75	6.9	653	23	13	94	0	0	127	22	139	4.5	0.4	0.05	60	410	111	
8-20-62				1.15	1.07	4.09			2.08	0.46	3.92	0.07						
				18	17	65			32	7	60	1				418		
12S/ 1W-20L 1 S	69	7.1	895	47	25	97	2	0	214	56	140	0	0.7	0	31	570	221	
4- 5-57				2.35	2.06	4.22	0.05		3.51	1.17	3.95							
				27	24	49	1		41	14	46					504		
12S/ 1W-30A 1 S	69	7.3	1136	66	35	119	4	0	270	78	180	1.2	0.5	0.06	40	721	309	
3-26-57				3.29	2.88	5.17	0.10		4.43	1.62	5.08	0.02						
				29	25	45	1		40	15	46					656		
12S/ 1W-30R 1 S	68	7.5	2012	86	51	264	2	0	359	127	392	0	1.0	0.20	50	1217	424	
3-26-57				4.29	4.19	11.48	0.05		5.88	2.64	11.05							
				21	21	57			30	13	56					1150		
12S/ 1W-31H 1 S	--	7.7	1310	103	44	158	2	0	385	82	260	3.4	0.2	0.14	36	862	438	
11-19-63				5.14	3.62	6.87	0.05		6.31	1.71	7.33	0.05						
				33	23	44			41	11	48					878		
12S/ 1W-32B 1 S	--	7.4	770	44	18	104	2	0	196	38	132	21	0.4	0.16	39	296	184	
11-19-63				2.20	1.48	4.52	0.05		3.21	0.79	3.72	0.34						
				27	18	55	1		40	10	46	4				495		
12S/ 1W-32E 1 S	--	7.9	1340	85	49	175	2	0	375	79	299	5.0	0.2	0.12	38	886	414	
11-19-63				4.24	4.03	7.61	0.05		6.15	1.64	8.43	0.08						
				27	25	48			38	10	52					917		
12S/ 1W-32G 1 S	--	7.1	1509	82	40	179	3	0	275	74	290	29	1.0	0.50	34	1015	369	
4-25-62				4.09	3.29	7.78	0.08		4.51	1.54	8.18	0.47						
				27	22	51	1		31	10	56	3				868		
12S/ 1W-33E 1 S	58	7.6	930	52	30	98	1	0	217	62	148	27.0	0.3	0.06	40	570	253	
3-28-58				2.59	2.47	4.26	0.03		3.56	1.29	4.17	0.44						
				28	26	46			38	14	44	5				565		
12S/ 1W-34J 1 S	67	7.2	885	70	34	71	2	0	326	86	72	0.2	0.1	0.02	40	539	315	
3-25-57				3.49	2.80	3.09	0.05		5.34	1.79	2.03							
				37	30	33	1		58	20	22					536		
12S/ 1W-34P 1 S	68	7.7	800	54	45	87	2	0	328	97	95	5.8	0.2	0.11	36	608	320	
11-19-63				2.69	3.70	3.78	0.05		5.38	2.02	2.68	0.09						
				26	36	37			53	20	26	1				583		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in									parts per million equivalents per million percent reactance value						Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃							
SAN PASOVAL HYDRO SUBUNIT				SAN DIEGUITO HYDRO UNIT										20500										
				205C0																				
12S/ 1W-358 2 S	61	7.5	480	34	19	39	2	0	169	39	44	2.3	0.2	0.03	35	323	163							
3-26-57				1.70	1.56	1.70	0.05		2.77	0.81	1.24	0.04												
				34	31	34	1		57	17	26	1				298								
12S/ 1W-350 2 S	68	7.7	628	35	21	64	2	0	237	26	70	0	0.2	0.06	40	381	174							
3-25-57				1.75	1.73	2.78	0.05		3.88	0.54	1.97													
				28	27	44	1		61	8	31					375								
12S/ 1W-35H 1 S	66	7.3	618	47	24	45	2	0	214	44	67	13	0.2	0.05	33		216							
7-20-61				2.35	1.97	1.96	0.05		3.51	0.92	1.89	0.21				388								
				37	31	31	1		54	14	29	3				380								
12S/ 1W-35H 2 S	62	7.8	955	72	50	100	4	0	342	46	103	19	0.6	0.14	--	552	385							
2- 3-60				3.59	4.11	4.35	0.10		5.61	0.96	2.90	0.31												
				30	34	36	1		57	10	30	3				563								
12S/ 1W-35L 3 S	68	7.0	916	59	44	75	3	0	265	62	108	66.5	0.3	0.03	50	661	328							
3-26-57				2.94	3.62	3.26	0.08		4.34	1.29	3.05	1.07												
				30	37	33	1		45	13	31	11				598								
12S/ 1W-36G 1 S	62	7.1	591	41	22	45	2	0	169	49	69	0.6	0.2	0.03	30	379	193							
3-26-57				2.05	1.81	1.96	0.05		2.77	1.02	1.95	0.01												
				35	31	33	1		48	18	34					342								
13S/ 1W- 3E 1 S	69	7.5	1107	71	43	109	2	0	415	71	117	1.0	0.5	0.05	40	673	354							
3-26-57				3.54	3.54	4.74	0.05		6.80	1.48	3.30	0.02												
				30	30	40			59	13	28					659								
13S/ 1W- 5A 1 S	58	7.3	2583	124	76	330	2	0	587	147	454	53.9	0.5	0.15	40	1589	622							
3-26-57				6.19	6.25	14.35	0.05		9.62	3.06	12.80	0.87												
				23	23	53			37	12	49	3				1516								
SANTA MARIA VALLEY HYDRO SUBUNIT				20500																				
12S/ 1E-36N 1 S	--	7.4	430	27	8	44	--	0	142	20	40	3.2	--	--	44	264	101							
4-29-63				1.35	0.66	1.91			2.33	0.42	1.13	0.05												
				34	17	49			59	11	29	1				256								
12S/ 1E-36P 1 S	--	7.4	588	38	16	49	--	0	185	26	60	--	--	0	46	384	161							
4-23-63				1.90	1.32	2.13			3.03	0.54	1.69													
12S/ 2E-32G 1 S	--	7.7	440	27	16	35	2	0	160	12	40	16	0.4	0	34	294	134							
4- 8-57				1.35	1.32	1.52	0.05		2.62	0.25	1.13	0.26												
				32	31	36	1		62	6	27	6				261								
12S/ 2E-33P 1 S	75	8.1	295	24	10	22	4	0	135	14	20	3.6	0.2	0.02	--	176	101							
6-16-64				1.20	0.82	0.96	0.10		2.21	0.29	0.56	0.06												
				39	27	31	3		71	9	18	2				164								
13S/ 1E- 3H 2 S	70	7.1	525	20	16	62	2	0	142	15	74	12.5	0.3	0.05	50	332	116							
3-26-57				1.00	1.32	2.70	0.05		2.33	0.31	2.09	0.20												
				20	26	53	1		47	6	42	4				322								
13S/ 1E-11M 1 S	--	7.7	930	47	24	143	2	0	296	37	164	8.0	0.6	0.16	43	562	216							
11-20-63				2.35	1.97	6.22	0.05		4.85	0.77	4.62	0.13												
				22	19	59			47	7	45	1				614								
13S/ 1E-15E 2 S	70	7.5	795	39	22	84	3	0	149	22	143	48	0.4	0	32	490	188							
3-26-57				1.95	1.81	3.65	0.08		2.44	0.46	4.03	0.77												
				26	24	49	1		32	6	52	10				467								
13S/ 1E-15M 1 S	--	7.9	1840	105	55	288	3	0	563	167	348	8.4	0.6	0.30	35	1238	488							
11-20-63				5.24	4.52	12.52	0.08		9.23	3.48	9.81	0.14												
				23	20	56			41	15	43	1				1287								
13S/ 1E-16P 1 S	65	7.2	1740	68	39	219	5	0	357	76	303	21	0.6	0.04	23	1040	330							
4- 5-57				3.39	3.21	9.52	0.13		5.85	1.58	8.54	0.34												
				21	20	59	1		36	10	52	2				930								
13S/ 1E-17J 2 S	--	7.7	900	64	36	105	5	0	137	294	92	0	0.2	0.09	7	780	308							
11-20-63				3.19	2.96	4.57	0.13		2.25	6.12	2.59													
				29	27	42	1		21	56	24					671								
13S/ 1E-17L 1 S	69	7.6	1083	34	23	140	3	0	124	27	228	47	0.8	0.02	--		180							
8-27-54				1.70	1.89	6.09	0.08		2.03	0.56	6.43	0.76												
				17	19	62	1		21	6	66	8				655								
																564								
13S/ 1E-17N 1 S	--	7.9	1135	53	45	94	2	0	123	28	250	38	1.0	0.02	31	644	317							
4- 6-57				2.64	3.70	4.09	0.05		2.02	0.58	7.05	0.61												
				25	35	39			20	6	69	6				602								
13S/ 1E-238 1 S	68	7.4	615	34	19	60	4	0	165	16	85	26.6	0.3	0.04	40	382	163							
3-26-57				1.70	1.56	2.61	0.10		2.70	0.33	2.40	0.43												
				28	26	44	2		46	6	41	7				366								
13S/ 1E-27K 1 S	64	7.6	840	30	23	110	4	0	139	42	180	1.0	0.7	0.03	25	512	170							
3-26-57				1.50	1.89	4.78	0.10		2.28	0.87	5.08	0.02												
				18	23	58	1		28	11	62					484								

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180 °F Computed	Total hardness as CaCO ₃	

SAN DIEGOITO HYDRO UNIT

SANTA MARIA VALLEY HYDRO SUBUNIT 20500

20500

135/ 1E-29P 1 S	68	7.7	591	33	15	60	2	0	137	13	106	1.3	0.4	0	75	365	144
3-26-57				1.65	1.23	2.61	0.05		2.25	0.27	2.99	0.02					
				30	22	47	1		41	5	54					323	
135/ 2E- 4H 1 S	73	7.7	390	26	18	27	2	0	156	16	27	18	0.2	0.15	--	260	139
6-16-64				1.30	1.48	1.17	0.05		2.56	0.33	0.76	0.29					
				33	37	29	1		65	8	19	7				211	
135/ 2E- 9H 1 S	64	7.2	630	41	25	52	2	0	218	41	70	0	0.4	0	36	412	206
4- 8-57				2.05	2.06	2.26	0.05		3.57	0.85	1.97						
				32	32	35	1		56	13	31					375	
135/ 2E- 9N 1 S	66	7.0	1045	67	37	100	3	0	317	57	133	20	0.6	0	35	700	319
4- 8-57				3.34	3.04	4.35	0.08		5.20	1.19	3.75	0.32					
				31	28	40	1		50	11	36	3				608	
135/ 2E-11C 1 S	68	7.2	450	22	15	46	5	0	140	37	50	2.6	0.4	0	34	296	117
4- 8-57				1.10	1.23	2.00	0.13		2.29	0.77	1.41	0.04					
				25	28	45	3		51	17	31	1				281	
135/ 2E-17C 1 S	68	6.9	665	36	19	62	2	0	180	25	65	45	0.7	0	34	400	168
4- 8-57				1.80	1.56	2.70	0.05		2.95	0.52	1.83	0.73					
				29	26	44	1		49	9	30	12				377	
135/ 1W-12R 1 S	--	7.6	879	55	37	66	2	0	203	56	124	45	0.3	0.11	64	560	289
2- 2-60				2.74	3.04	2.87	0.05		3.33	1.17	3.50	0.73					
				31	35	33	1		38	13	40	8				549	
135/ 1W-24R 1 S	--	6.8	680	34	20	62	2	0	58	12	140	51	0.1	0.02	40	449	167
4-24-62				1.70	1.64	2.70	0.05		0.95	0.25	3.95	0.82					
				28	27	44	1		16	4	66	14				390	
135/ 1W-24R 2 S	--	7.1	500	20	14	52	2	0	49	20	98	30	0.1	0.01	25	296	108
3-27-57				1.00	1.15	2.26	0.05		0.80	0.42	2.76	0.48					
				22	26	51	1		18	9	62	11				285	

SANTA YSABEL HYDRO SUBUNIT

20500

115/ 1E-35P 2 S	64	8.0	442	40	16	30	2	0	181	39	33	0	0.2	0.05	30	279	166
3-26-57				2.00	1.32	1.30	0.05		2.97	0.81	0.93						
				43	28	28	1		63	17	20					279	
115/ 2E-21K51 5	--	7.8	489	42	33	16	1	0	286	--	17	0.6	--	0.06	--		241
11- 4-52				2.10	2.71	0.70	0.03		4.69		0.48	0.01					
115/ 2E-25N51 5	60	7.0	191	14	5	17	4	--	72	--	14	1.9	--	0.46	--		56
11- 6-52				0.70	0.41	0.74	0.10		1.18		0.39	0.03					
115/ 2E-34R 1 S	--	7.3	411	40	15	23	1	0	160	33	33	0	0.1	0.16	35	294	162
11-30-58				2.00	1.23	1.00	0.03		2.62	0.69	0.93						
				47	29	23	1		62	16	22					259	
115/ 2E-35B 1 S	--	7.4	435	49	16	19	6	0	224	22	16	0	0.2	0.03	36	290	189
10-13-63				2.45	1.32	0.83	0.15		3.67	0.46	0.45						
				52	28	17	3		80	10	10					274	
115/ 2E-35C51 5	--	7.6	533	61	22	23	2	0	281	20	31	0	0	0.44	43	409	243
11-28-58				3.04	1.81	1.00	0.05		4.61	0.42	0.87						
				52	31	17	1		78	7	15					341	
115/ 2E-35C 2 S	--	7.5	405	46	14	21	2	0	224	6	19	1.0	0.2	0.06	52	300	173
9-24-61				2.30	1.15	0.91	0.05		3.67	0.12	0.54	0.02					
				52	26	21	1		84	3	12					271	
125/ 1E-11L 1 S	64	7.8	630	48	23	49	2	0	206	54	66	0.4	0.2	0.06	30	336	215
3-26-57				2.40	1.89	2.13	0.05		3.38	1.12	1.86	0.01					
				37	29	33	1		53	18	29					374	
125/ 1E-11P 1 S	--	7.0	805	62	25	62	2	0	222	115	73	6.2	0.2	0.10	--		258
8- 6-53				3.09	2.06	2.70	0.05		3.64	2.39	2.06	0.10					
				39	26	34	1		44	29	25	1				470	
																455	
125/ 2E- 38S2 5	--	7.2	168	12	5	12	2	0	64	5	12	7.4	0.3	0.02	39	93	51
8- 9-62				0.60	0.41	0.52	0.05		1.05	0.10	0.34	0.12					
				38	26	33	3		65	6	21	7				126	
125/ 2E-10G53 5	--	7.5	268	20	9	22	4	0	118	--	10	2.4	--	0.05	--		87
11- 5-52				1.00	0.74	0.96	0.10		1.93		0.28	0.04					
125/ 2E-13Q 1 S	--	7.7	342	27	7	32	4	0	134	--	28	0.4	--	0.06	--		97
11- 6-52				1.35	0.58	1.39	0.10		2.20		0.79	0.01					
125/ 3E-16C 1 S	57	6.7	370	25	14	27	1	0	108	31	37	4.7	0.2	0.03	40	274	120
3-26-57				1.25	1.15	1.17	0.03		1.77	0.65	1.04	0.08					
				35	32	33	1		50	18	29	2				233	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Hardness as CaCO ₃		
SANTA YSABEL HYDRO SUBUNIT				SAN DIEGUITO HYDRO UNIT										20500					
205E0																			
12S/ 3E-28C 1 S	53	7.4	380	29	12	25	3	0	145	10	30	5	0.1	0	282	230	122		
3-26-57				1.45	0.99	1.09	0.08		2.38	0.21	0.85	0.08							
				40	27	30	2		68	6	24	2					467		
12S/ 3E-31N 1 S	70	7.7	755	61	30	48	4	0	130	80	99	72	0.2	0.05	--	478	276		
6-16-64				3.04	2.47	2.09	0.10		2.13	1.67	2.79	1.16							
				39	32	27	1		27	22	36	15					458		
SOLEDAO HYDRO SUBUNIT				PENASQUITO HYDRO UNIT										20600					
206A0																			
14S/ 3W-16O 1 S	--	7.4	2366	131	68	239	5	0	124	252	550	0	0	0.40	3	1418	607		
8- 4-59				6.54	5.59	10.39	0.13		2.03	5.25	15.51								
				29	25	46	1		9	23	68						1309		
14S/ 3W-17E 1 S	70	7.5	5400	412	14	825	16	0	48	821	1461	0	0.6	2.00	9	4076	1086		
8-23-62				20.56	1.15	35.87	0.41		0.79	17.09	41.20								
				35	2	62	1		1	29	70						3584		
14S/ 3W-17L 2 S	--	7.6	2857	302	60	260	6	0	351	600	468	2.5	0.8	0.24	34	1940	1001		
12- 4-63				15.07	4.93	11.30	0.15		5.75	12.49	13.20	0.04							
				48	16	36			18	40	42						1906		
14S/ 3W-18F 1 S	--	7.6	2400	286	11	210	5	0	155	208	620	0	0.6	0.25	28	1824	759		
8-22-62				14.27	0.90	9.13	0.13		2.54	4.33	17.48								
				58	4	37	1		10	18	72						1445		
14S/ 3W-18F 2 S	69	7.7	2695	239	67	258	7	0	237	555	472	16	1.0	0.24	31	1760	873		
12- 4-62				11.93	5.51	11.22	0.18		3.88	11.56	13.31	0.26							
				41	19	39	1		13	40	46	1					1763		
14S/ 3W-18K 1 S	--	7.5	2775	265	78	270	6	0	341	--	465	0	0.6	0.29	20	2188	982		
8-21-61				13.22	6.41	11.74	0.15		5.59		13.11								
14S/ 3W-18L 1 S	--	7.1	2620	247	66	260	6	0	296	--	539	0	0.6	0.20	20	2088	889		
8-22-62				12.33	5.43	11.30	0.15		4.85		15.20								
14S/ 3W-18L 3 S	--	7.0	3220	240	92	305	6	0	206	--	851	0	0.1	0.20	24	2206	978		
8-23-62				11.98	7.57	13.26	0.15		3.38		24.00								
14S/ 3W-18L 4 S	--	7.3	2600	241	77	260	6	0	327	--	431	0	0.6	0.26	18	2052	919		
8-24-62				12.03	6.33	11.30	0.15		5.36		12.15								
14S/ 3W-18L 5 S	--	7.5	2640	246	74	270	6	0	327	--	465	0	0.6	0.20	18	1992	919		
8-24-62				12.28	6.09	11.74	0.15		5.36		13.11								
14S/ 3W-18L 6 S	--	7.7	1115	67	31	126	5	0	122	294	117	1.0	0.6	0.15	2	730	295		
8-16-62				3.34	2.55	5.48	0.13		2.00	6.12	3.30	0.02							
				29	22	48	1		17	53	29						704		
14S/ 3W-18M 1 S	--	7.1	3614	252	77	370	14	0	183	214	1000	0	0.3	0.22	30	2750	946		
8-15-62				12.57	6.33	16.09	0.36		3.00	4.46	26.20								
				36	18	46	1		8	13	79						2047		
14S/ 3W-18N 1 S	70	7.4	3018	174	51	376	13	0	203	115	843	2.5	0.4	0.34	35	2060	644		
8-16-62				8.68	4.19	16.35	0.33		3.33	2.39	23.77	0.04							
				29	14	55	1		11	8	80						1710		
14S/ 3W-19H 1 S	--	7.5	1940	146	36	210	4	0	206	217	418	7.0	0.4	0.21	34	1348	513		
8- 9-62				7.29	2.96	9.13	0.10		3.38	4.52	11.79	0.11							
				37	15	47	1		17	23	60	1					1174		
14S/ 3W-19N 1 S	--	7.2	9000	757	207	1175	29	0	313	792	2952	6.0	0.2	0.64	23	6706	2742		
8- 8-62				37.77	17.02	51.09	0.74		5.13	16.49	83.25	0.10							
				35	16	48	1		5	16	79						6096		
14S/ 3W-19N 3 S	--	7.2	3125	290	64	320	5	0	284	478	697	0	0.8	0.31	33	2262	987		
8- 8-62				14.47	5.26	13.91	0.13		4.65	9.95	19.66								
				43	16	41			14	29	57						2028		
14S/ 3W-19P 1 S	--	7.4	1875	155	51	189	3	0	261	259	358	22	0.8	0.30	28		596		
7-27-61				7.73	4.19	8.22	0.08		4.28	5.39	10.10	0.35							
				38	21	41			21	27	50	2					1580		
																	1194		
14S/ 3W-19P 2 S	--	7.6	1830	140	45	174	2	0	244	230	324	22	0.8	0.36	22		535		
4-11-62				6.99	3.70	7.57	0.05		4.00	4.79	9.14	0.35							
				38	20	41			22	26	50	2					1064		
																	1080		
14S/ 3W-19O 1 S	--	7.8	1230	77	41	165	4	0	312	160	202	2.7	0.6	0.26	23	860	361		
10-30-63				3.84	3.37	7.17	0.10		5.11	3.33	5.70	0.04							
				27	23	50	1		36	23	40						829		
14S/ 3W-20F 1 S	--	7.4	1550	96	44	160	1	0	221	116	340	1.0	0.6	0.21	22	874	421		
8- 9-62				4.79	3.62	6.96	0.03		3.62	2.42	9.59	0.02							
				31	24	45			23	15	61						889		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date sampled																	

SOLEAD HYDRO SUBUNIT				PENASQUITO HYDRO UNIT									Z0600				
14S/ 3W-20L 2 S	--	7.5	1200	84	37	145	2	0	255	182	191	0	0.6	0.41	21	850	362
10-30-63				4.19	3.04	6.30	0.05		4.18	3.79	5.39					788	
				31	22	46			31	28	40						
14S/ 3W-210 1 S	--	8.2	1310	116	32	119	2	0	183	171	227	33	0.5	0.05	29	868	421
2-28-63				5.79	2.63	5.17	0.05		3.00	3.56	6.40	0.53				819	
				42	19	38			22	26	47	4					
14S/ 3W-22E 1 S	--	7.5	5633	369	134	750	8	0	405	1416	930	6.2	0.8	0.72	19	4100	1473
8-14-62				18.41	11.02	32.61	0.20		6.64	29.48	26.23	0.10				3833	
				30	18	52			11	47	42						
14S/ 3W-22F 1 S	--	6.9	5327	409	124	752	9	0	290	1450	1055	3.7	0.8	0.77	18	4299	1532
8-14-62				20.41	10.20	32.70	0.23		4.75	30.19	29.75	0.06				3965	
				32	16	51			7	47	46						
14S/ 3W-24J 1 S	70	7.7	2518	123	54	340	3	0	227	183	630	1.5	1.0	0.36	--		529
11-29-54				6.14	4.44	14.78	0.08		3.72	3.81	17.77	0.02				1540	
				24	17	58			15	15	70					1447	
14S/ 3W-29G 1 S	--	7.1	435	13	9	63	1	0	139	29	46	0	0.2	0.41	22	260	70
8-10-62				0.65	0.74	2.74	0.03		2.28	0.60	1.30					252	
				16	18	66	1		55	14	31						
14S/ 3W-29H 1 S	--	7.8	2220	170	50	230	3	0	312	195	479	16	0.8	0.33	25	1512	630
8-10-62				8.48	4.11	10.00	0.08		5.11	4.06	13.51	0.26				1323	
				37	18	44			22	18	59	1					
14S/ 3W-30F 1 S	70	7.4	3627	191	113	375	5	0	115	156	1040	69	0.7	0.49	56	2889	942
8-15-62				9.53	9.29	16.31	0.13		1.88	3.25	29.33	1.11				2063	
				27	26	46			5	9	82	3					
14S/ 3W-30G 1 S	70	6.8	1880	122	51	174	5	0	135	116	472	2.0	0.7	0.17	46	1369	514
8-16-62				6.09	4.19	7.57	0.13		2.21	2.42	13.31	0.03				1055	
				34	23	42	1		12	13	74						
14S/ 3W-320 1 S	--	7.5	2890	245	76	370	--	0	410	472	583	--	--	0.40	33	2208	925
2- 8-63				12.23	6.25	16.09			6.72	9.83	16.44						
14S/ 3W-32R 1 S	--	7.9	3030	220	102	361	4	0	406	582	590	5.0	1.0	0.19	24	2198	969
2-28-63				10.98	8.39	15.70	0.10		6.65	12.12	16.64	0.08				2089	
				31	24	45			19	34	47						
14S/ 4W-25A 1 S	71	7.4	890	59	19	85	3	0	180	54	147	20	0.4	0.18	34	536	225
8- 8-62				2.94	1.56	3.70	0.08		2.95	1.12	4.15	0.32				510	
				36	19	45	1		35	13	49	4					
14S/ 4W-25A 2 S	--	7.2	2678	198	51	241	7	0	303	323	454	1	0.3	0.19	15	1727	704
7-14-59				9.88	4.19	10.48	0.18		4.97	6.72	12.80	0.02				1439	
				40	17	42	1		20	27	52						
14S/ 4W-25A 3 S	--	7.5	2475	193	46	280	6	0	312	321	510	0	0.6	0.36	23	1672	671
8- 8-62				9.63	3.78	12.17	0.15		5.11	6.68	14.38					1533	
				37	15	47	1		20	26	55						
15S/ 3W- 10 1 S	--	7.7	2510	303	123	153	3	0	369	817	312	1.2	0.9	0.05	30	2079	1263
2-28-63				15.12	10.12	6.65	0.08		6.05	17.01	8.80	0.02				1925	
				47	32	21			19	53	26						
15S/ 3W- 3N 1 S	62	6.2	267	9	5	29	2	0	25	23	42	0.8	0.4	0.14	19		43
4-12-62				0.45	0.41	1.26	0.05		0.41	0.48	1.18	0.01				188	
				21	19	58	2		20	23	57					143	
15S/ 3W- 3N 2 S	--	8.5	935	55	43	99	4	7	136	281	90	0	0.2	0.14	9	704	314
10-30-63				2.74	3.54	4.30	0.10	0.23	2.23	5.85	2.54					655	
				26	33	40	1	2	21	54	23						
15S/ 3W- 6H 1 S	--	8.1	1365	36	26	232	11	0	378	126	190	1.2	0.7	0.34	19	812	197
2-28-63				1.80	2.14	10.09	0.28		6.20	2.62	5.36	0.02				828	
				13	15	71	2		44	18	38						
POWAY HYDRO SUBUNIT				Z0680													
14S/ 1W- 6C 2 S	--	7.3	1058	53	38	106	4	0	220	45	195	23	0.5	0.08	49	627	289
2-27-63				2.64	3.13	4.61	0.10		3.61	0.94	5.50	0.37				622	
				25	30	44	1		35	9	53	4					
14S/ 1W- 6P 1 S	--	8.5	950	37	40	119	3	9	190	127	155	0	0.2	0.44	25	598	257
11-19-63				1.85	3.29	5.17	0.08	0.30	3.11	2.64	4.37					609	
				18	32	50	1	3	30	25	42						
14S/ 1W-18K 1 S	--	6.9	1355	51	50	156	2	0	159	58	308	61	0.5	0.07	50	771	333
8-18-60				2.54	4.11	6.78	0.05		2.61	1.21	8.69	0.98				815	
				19	30	50			19	9	64	7					
14S/ 1W-18K 2 S	--	7.7	1270	54	29	153	2	0	192	67	230	36	0.4	0.23	40	810	254
11- 7-63				2.69	2.38	6.65	0.05		3.15	1.39	6.49	0.58				706	
				23	20	56			27	12	56	5					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

POWAY HYDRO SUBUNIT			PENASQUITO HYDRO UNIT										20600						
			20680																
14S/ 1W-21H 1 S	70	7.2	1263	84	32	144	1	0	290	48	238	18	1.3	0.11	60	745	341		
5-28-64				4.19	2.63	6.26	0.03		4.75	1.00	6.71	0.29							
				32	20	48			37	8	53	2					769		
14S/ 2W- 1R 2 S	--	7.3	5118	335	37	765	21	0	142	846	1175	9.3	1.4	2.80	--	3382	989		
3-11-64				16.72	3.04	33.26	0.54		2.33	17.61	33.14	0.15							
				31	6	62	1		4	33	62						3262		
14S/ 2W-12K 1 S	--	7.0	2023	68	58	274	0	0	368	156	378	17.3	0.6	0	38	1311	408		
7-24-58				3.39	4.77	11.91			6.03	3.25	10.66	0.28							
				17	24	59			30	16	53	1					1171		
14S/ 2W-13L 1 S	--	7.4	2260	133	66	239	1	0	311	240	434	6.1	1.0	0.07	47	1436	604		
4-24-62				6.64	5.43	10.39	0.03		5.10	5.00	12.24	0.10							
				30	24	46			23	22	55						1320		
14S/ 2W-15R 1 S	--	7.4	1930	82	68	262	3	0	309	184	429	9.8	0.4	0.32	35	1286	484		
11-19-63				4.09	5.59	11.39	0.08		5.06	3.83	12.10	0.16							
				19	26	54			24	18	57	1					1225		
MIRAMAR HYDRO SUBUNIT			20600																
15S/ 2W- 2K 1 S	--	8.2	2010	108	50	287	3	0	531	208	321	1.2	1.1	0.12	29	1235	475		
2-28-63				5.39	4.11	12.48	0.08		8.70	4.33	9.05	0.02							
				24	19	57			39	20	41						1269		
15S/ 2W- 5L 1 S	--	7.9	2780	122	78	402	4	0	403	229	665	1.2	1.4	0.15	26	1790	626		
2-27-63				6.09	6.41	17.48	0.10		6.61	4.77	18.75	0.02							
				20	21	58			22	16	62						1727		
15S/ 2W-190 1 S	78	7.8	2400	85	51	395	3	0	458	261	436	0	1.0	2.50	23	1582	422		
3-28-63				4.24	4.19	17.17	0.08		7.51	5.43	12.30								
				17	16	67			30	22	49						1483		
15S/ 3W- 1M 1 S	69	7.5	1545	110	48	155	4	0	303	373	154	0	0.6	0.45	25	1166	472		
8-30-62				5.49	3.95	6.74	0.10		4.97	7.77	4.34								
				34	24	41	1		29	45	25						1019		
15S/ 3W- 9K 1 S	--	7.6	1220	109	43	85	4	0	306	148	168	0	1.0	0.18	22	918	449		
8-30-62				5.44	3.54	3.70	0.10		5.02	3.08	4.74								
				43	28	29	1		39	24	37						731		
15S/ 3W-23P 2 S	75	7.9	1683	126	52	254	6	0	382	295	336	0.0	1.5	0.24	30	1378	529		
9-18-57				6.29	4.28	11.04	0.15		6.26	6.14	9.48								
				29	20	51	1		29	28	43						1289		
15S/ 3W-24N 1 S	--	6.7	619	22	20	80	5	0	51	105	121	0.0	0.3	0.22	40	484	137		
9-18-57				1.10	1.64	3.48	0.15		0.84	2.19	3.41								
				17	26	55	2		13	34	53						420		
15S/ 3W-26C 1 S	--	7.7	1681	81	47	253	4	0	362	211	307	0.0	1.2	0.24	30	1116	396		
9-18-57				4.04	3.87	11.00	0.10		5.93	4.39	8.66								
				21	20	58	1		31	23	46						1112		
15S/ 3W-260 1 S	--	8.2	1170	43	21	220	7	24	305	105	191	0.0	0.6	0.38	20	780	194		
9-18-57				2.15	1.73	9.57	0.18	0.80	5.00	2.19	5.39								
				16	13	70	1	6	37	16	40						782		
15S/ 3W-30E 1 S	--	7.0	3250	224	145	317	2	0	383	897	435	14	0.6	1.80	17		1156		
4-12-62				11.18	11.92	13.78	0.05		6.28	18.68	12.27	0.23							
				30	32	37			17	50	33	1					2446		
																	2242		
15S/ 3W-360 1 S	--	7.1	1975	82	47	260	12	0	384	185	337	0	0.6	0.20	20	1345	398		
2-23-60				4.09	3.87	11.30	0.31		6.29	3.85	9.50								
				21	20	58	2		32	20	48						1133		
16S/ 3W- 5E 1 S	--	7.6	1900	56	43	290	6	0	419	183	307	0	0.6	0.49	15	1106	317		
4-12-62				2.79	3.54	12.61	0.15		6.87	3.81	8.66								
				15	19	66	1		36	20	45						1107		
16S/ 3W- 5E 3 S	--	7.2	3220	186	92	453	5	0	458	588	610	21	0.9	0.38	21	2313	843		
2-27-63				9.28	7.57	19.70	0.13		7.51	12.24	17.20	0.34							
				25	21	54			20	33	46	1					2202		
TECOLOTE HYDRO SUBUNIT			20600																
15S/ 3W-35G 1 S	--	7.6	1252	44	12	208	9	0	326	127	169	0	0.6	0.50	18	885	160		
2-23-60				2.20	0.99	9.04	0.23		5.34	2.64	4.77								
				18	8	73	2		42	21	37						748		
15S/ 3W-35G 3 S	--	7.5	1764	73	33	251	10	0	362	164	306	0	0.4	0.70	19	1217	318		
2-23-60				3.64	2.71	10.91	0.26		5.93	3.41	8.63								
				21	15	62	1		33	19	48						1035		
16S/ 3W-16R 1 S	78	8.0	1890	47	40	289	9	0	337	154	348	1.5	0.7	0.39	21		282		
10-19-55				2.35	3.29	12.57	0.23		5.52	3.21	9.81	0.02							
				13	18	68	1		30	17	53						1076		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃
Date sampled																	

SAN DIEGO HYDRO UNIT

20700

LOWER SAN DIEGO HYDRO SUBUNIT

207A.

14S/ 1E-33L 1 S	65	7.2	684	30	16	96	2	0	224	10	103	0	0.6	0.04	40	360	141
5-27-64				1.50	1.32	4.17	0.05		3.67	0.21	2.90						
				21	19	59	1		54	3	43						406
15S/ 1E- 2G51 S	68	7.0	580	38	24	39	2	0	209	18	63	1	0.2	0	58	401	194
4- 7-59				1.90	1.97	1.70	0.05		3.43	0.37	1.78	0.02					
				34	35	30	1		61	7	32						346
15S/ 1E- 2K 1 S	68	7.1	563	45	21	40	2	0	214	19	64	1	0	0.18	55	401	199
4- 7-59				2.25	1.73	1.74	0.05		3.51	0.40	1.80	0.02					
				39	30	30	1		61	7	31						352
15S/ 1E- 2P 1 S	68	7.1	377	27	14	42	2	0	137	87	64	10	0.3	0.05	39	279	125
2-19-59				1.35	1.15	1.83	0.05		2.25	1.81	1.80	0.16					
				31	26	42	1		37	30	30	3					353
15S/ 1E- 6N 1 S	--	7.3	1620	222	57	105	--	0	117	740	124	0	--	0	41	1552	789
6- 4-63				11.08	4.69	4.57			1.92	15.41	3.50						
				54	23	22			9	74	17						1347
15S/ 1E- 7K 1 S	72	7.0	1220	49	49	112	4	0	171	54	220	86	0.3	0.06	46	796	324
2-20-59				2.45	4.03	4.87	0.10		2.80	1.12	6.20	1.39					
				21	35	43	1		24	10	54	12					704
15S/ 1E- 7L 1 S	--	7.5	725	23	22	105	3	0	166	33	135	26.3	0.7	0.12	--		148
8-26-54				1.15	1.81	4.57	0.08		2.72	0.69	3.81	0.42					
				15	24	60	1		36	9	50	5					470 430
15S/ 1E- 7L 2 S	69	7.1	1098	32	36	125	4	0	201	31	222	0	0.5	0.24	53	710	228
2-25-60				1.60	2.96	5.44	0.10		3.29	0.65	6.26						
				16	29	54	1		32	6	61						603
15S/ 1E- 8G 1 S	68	7.2	1480	132	57	121	6	0	232	83	227	263	0.3	0.02	55	1044	564
2-19-59				6.59	4.69	5.26	0.15		3.80	1.73	6.40	4.24					
				39	28	32	1		24	11	40	26					1058
15S/ 1E- 9J 1 S	56	7.2	550	36	34	50	6	0	149	105	76	7.4	0.1	0.04	21	365	230
1-28-59				1.80	2.80	2.17	0.15		2.44	2.19	2.14	0.12					
				26	40	31	2		35	32	31	2					409
15S/ 1E- 9P 1 S	--	7.3	--	49	18	46	--	0	199	56	54	0	--	--	31	360	197
9-28-49				2.45	1.48	2.00			3.26	1.17	1.52						
				41	25	34			55	20	26						352
15S/ 1E- 9Q 2 S	--	7.3	--	44	17	46	--	0	205	29	59	0	--	--	37	340	180
9-28-49				2.20	1.40	2.00			3.36	0.60	1.66						
				39	25	36			60	11	30						333
15S/ 1E- 9R 1 S	--	7.1	--	35	15	51	--	0	187	30	54	0	--	--	25	310	149
10-10-49				1.75	1.23	2.22			3.06	0.62	1.52						
				34	24	43			59	12	29						302
15S/ 1E- 9R 2 S	60	8.0	557	40	19	43	2	0	180	25	64	1.8	0.2	0.05	36	334	178
1-28-59				2.00	1.56	1.87	0.05		2.95	0.52	1.80	0.03					
				36	28	34	1		56	10	34	1					320
15S/ 1E-10A 1 S	--	8.1	731	58	27	54	3	0	255	35	83	18.3	0	0.12	34	453	256
7-23-58				2.89	2.22	2.35	0.08		4.18	0.73	2.34	0.30					
				38	29	31	1		55	10	31	4					438
15S/ 1E-10H 1 S	66	7.7	760	62	26	60	3	0	255	60	94	0	0.2	0.08	25	482	262
11- 7-63				3.09	2.14	2.61	0.08		4.18	1.25	2.65						
				39	27	33	1		52	15	33						456
15S/ 1E-10N 1 S	--	7.3	--	40	15	53	--	0	193	34	59	0	--	--	19	315	162
10-10-49				2.00	1.23	2.30			3.16	0.71	1.66						
				36	22	42			57	13	30						315
15S/ 1E-12R51 S	--	6.8	322	15	17	24	1	0	132	12	28	6.0	0.2	0.02	--		108
12-29-52				0.75	1.40	1.04	0.03		2.16	0.25	0.79	0.10					
				23	43	32	1		65	8	24	3					228 166
15S/ 1E-16B 1 S	--	7.3	--	72	20	26	--	0	211	53	64	0	--	--	37	385	26.
9-23-49				3.59	1.64	1.13			3.46	1.10	1.80						
				56	26	18			54	17	28						376
15S/ 1E-16C 2 S	--	7.3	--	49	19	50	--	0	224	36	62	0	--	--	37	370	201
9-27-49				2.45	1.56	2.17			3.67	0.79	1.75						
				40	25	35			59	13	28						365
15S/ 1E-16C 3 S	--	6.9	--	41	19	55	--	0	187	63	59	0	--	--	19	360	181
10-11-49				2.05	1.56	2.39			3.06	1.31	1.66						
				34	26	40			51	22	28						348
15S/ 1E-16C 4 S	--	7.3	--	61	20	36	--	0	199	71	54	0	--	--	31	380	234
9-28-49				3.04	1.64	1.57			3.26	1.48	1.52						
				49	26	25			52	24	24						371
15S/ 1E-16E 1 S	--	7.3	--	60	19	36	--	0	218	44	54	0	--	--	37	370	228
9-27-49				2.99	1.56	1.57			3.57	0.92	1.66						
				49	25	26			58	15	27						362

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in										Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C 105°C Computed	Total hardness as CaCO ₃		
Date sampled																			
LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT										20700					
207A0																			
15S/ 1E-17B 2 S 1-28-59	66	7.4	805	62 3.09 36	29 2.38 28	69 3.00 35	3 0.08 1	0	254 4.16 49	73 1.52 18	98 2.76 33	0	0.4	0.02	30	480 489	274		
15S/ 1E-17O 2 S 6- 3-60	77	7.4	698	53 2.64 38	26 2.14 31	48 2.09 30	1 0.03	0	212 3.47 51	64 1.33 19	73 2.06 30	0	0.2	0.08	26	485 395	239		
15S/ 1E-17H 1 S 9-27-49	--	7.1	--	51 2.54 43	19 1.56 26	43 1.87 31	--	0	193 3.16 53	43 0.90 15	69 1.95 32	0	--	--	31	360 351	205		
15S/ 1E-17H 2 S 1-27-47	--	6.9	--	47 2.35	20 1.64	56 2.43	--	--	211 3.46	51 1.06	67 1.89	--	--	--	19	365	200		
15S/ 1E-17H 3 S 1-27-47	--	7.0	--	37 1.85	19 1.56	62 2.70	--	--	198 3.25	46 0.96	67 1.89	--	--	--	31	365	171		
15S/ 1E-17H 4 S 1-27-47	--	6.8	--	34 1.70	15 1.23	59 2.57	--	--	178 2.92	39 0.81	62 1.75	--	--	--	19	320	147		
15S/ 1E-17H 7 S 2-25-60	68	7.3	670	48 2.40 36	22 1.81 27	53 2.30 35	3 0.08 1	0	165 2.70 40	88 1.83 27	78 2.20 32	3.1 0.05 1	0.6	0.05	40	391 417	211		
15S/ 1E-18J 1 S 4- 7-59	--	7.1	905	50 2.50 30	27 2.22 27	81 3.52 42	4 0.10 1	0	130 2.13 26	35 0.73 9	182 5.13 63	13 0.21 3	0.2	0	46	581 502	236		
15S/ 1E-18J 2 S 6- 2-60	--	7.6	736	36 1.80 27	21 1.73 26	72 3.13 46	4 0.10 1	0	131 2.15 28	23 0.48 6	134 3.78 50	73 1.18 16	0.2	0	31	505 459	177		
15S/ 1E-18L 1 S 4- 8-59	68	7.0	812	67 3.34 39	30 2.47 29	61 2.65 31	3 0.08 1	0	218 3.57 42	133 2.77 32	80 2.26 26	0	0.2	0	30	574 511	291		
15S/ 1E-19F 1 S 4- 8-59	69	7.6	1233	58 2.89 23	34 2.80 22	157 6.83 54	2 0.05	0	322 5.28 42	71 1.48 12	189 5.33 43	23 0.37 3	0.6	0	41	861 734	285		
15S/ 1E-19H 1 S 2-20-59	--	7.4	607	40 2.00 33	19 1.56 26	55 2.39 40	1 0.03 1	0	122 2.00 33	79 1.64 27	53 1.49 25	55 0.89 15	0.1	0.07	45	429 407	178		
15S/ 1E-23D 1 S 2-25-60	--	8.1	947	72 3.59 39	17 1.40 15	98 4.26 46	2 0.05 1	0	177 2.90 32	53 1.10 12	181 5.10 56	2.5 0.04	0.6	0.04	39	530 552	250		
15S/ 1E-29F 1 S 6-16-58	73	7.4	2313	130 6.49 28	83 6.83 29	226 9.83 42	5 0.13 1	0	389 6.38 28	171 3.56 15	457 12.89 56	11.1 0.18	0.4	0.40	40	1571 1315	667		
15S/ 1E-29M 1 S 2-19-59	71	7.4	1055	60 2.99 26	35 2.88 25	133 5.78 49	1 0.03	0	220 3.61 31	79 1.64 14	184 5.19 45	73 1.18 10	0.6	0.09	49	738 723	294		
15S/ 1E-30HS1 S 2- 8-60	--	--	--	46 2.30 27	26 2.14 25	94 4.09 48	3 0.08 1	5 0.17 2	132 2.16 26	67 1.39 17	163 4.60 55	4.0 0.06 1	0.7	--	--	222 609 474			
15S/ 1E-31R 1 S 11- 6-63	--	7.1	1310	71 3.54 26	39 3.21 23	162 7.04 51	3 0.08 1	0	178 2.92 21	172 3.58 26	216 6.09 45	65 1.05 8	0.4	0.17	37	900 853	338		
16S/ 1E- 5M 1 S 6-26-51	--	8.5	1330	86 4.29 32	40 3.29 24	132 5.74 43	6 0.15 1	12 0.40 3	234 3.84 29	95 1.98 15	245 6.91 53	0	0.4	0.16	48	780 780	379		
16S/ 1E- 5N 2 S 6-25-51	--	7.4	1767	--	--	--	--	0	328 5.38	--	245 6.91	179 2.89	--	--	--		532		
16S/ 1E- 5P 1 S 6-21-51	--	8.0	1476	89 4.44 30	46 3.78 26	147 6.39 44	--	0	227 3.72 24	199 4.14 27	205 5.78 37	113 1.82 12	--	0	--	920 911	411		
16S/ 1E- 5P 2 S 6-25-51	--	8.2	1610	107 5.34 33	42 3.45 21	166 7.22 45	4 0.10 1	0	244 4.00 25	150 3.12 20	302 8.52 54	6.4 0.10 1	0.4	0.20	41	939 939	440		
16S/ 1E- 6C 1 S 4-23-51	--	7.7	1470	71 3.54 24	43 3.54 24	170 7.39 51	3 0.08 1	0	222 3.64 26	110 2.29 16	214 6.03 42	140 2.26 16	0.5	0.09	43	904 904	354		
16S/ 1E- 6O 1 S 4-17-51	--	7.6	1240	68 3.39 29	39 3.21 27	119 5.17 44	4 0.10 1	0	205 3.36 28	131 2.73 23	133 3.75 31	133 2.15 18	--	0.16	56	784 784	330		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT										20700									
207A0																							
16S/ 1E- 6E 3 S	--	8.1	1600	6	13	295	1	0	241	133	221	107	--	0.17	34	929	69						
4-17-51				0.30	1.07	12.83	0.03		3.95	2.77	6.23	1.73											
				2	8	90			27	19	42	12					929						
16S/ 1E- 6F 1 S	--	7.4	1480	88	49	130	3	0	205	136	228	98	--	0.11	48	879	421						
4-19-51				4.39	4.03	5.65	0.08		3.36	2.83	6.37	1.58											
				31	28	40	1		24	20	45	11					879						
16S/ 1E- 6F 3 S	77	7.5	1390	74	46	135	3	0	182	103	193	136	--	0.20	47	827	374						
4-19-51				3.69	3.78	5.87	0.08		2.98	2.14	5.44	2.19											
				27	28	44	1		23	17	43	17					827						
16S/ 1E- 6G 1 S	--	7.6	1480	72	44	172	3	0	223	109	211	197	--	0.16	48	966	361						
4-18-51				3.59	3.62	7.48	0.08		3.65	2.27	5.95	3.18											
				24	25	51	1		24	15	40	21					966						
16S/ 1E- 6G 3 S	--	8.5	1560	92	49	175	4	10	172	205	185	222	0.4	0.36	52	1080	431						
6-26-51				4.59	4.03	7.61	0.10	0.33	2.82	4.27	5.22	3.58											
				28	25	47	1	2	17	26	32	22					1079						
16S/ 1E- 6L 1 S	--	7.4	1862	126	71	166	--	0	246	177	313	150	--	0.13	--		607						
3-27-51				6.29	5.84	7.22			4.03	3.69	8.83	2.42											
				33	30	37			21	19	47	13					1344 1124						
16S/ 1E- 6L 2 S	--	7.3	2440	173	96	170	4	0	218	264	408	204	--	0.08	48	1470	827						
4-19-51				8.63	7.90	7.39	0.10		3.57	5.50	11.51	3.29											
				36	33	31			15	23	48	14					1474						
16S/ 1E- 6M 1 S	--	7.6	1530	85	85	106	1	0	278	154	212	86	--	0.08	64	930	562						
4- 9-51				4.24	6.99	4.61	0.03		4.56	3.21	5.98	1.39											
				27	44	29			30	21	39	9					930						
16S/ 1E- 6N 1 S	--	8.2	1934	--	--	--	--	0	244	--	375	142	--	--	--		600						
6-27-51									4.00		10.58	2.29											
16S/ 1E- 6O 1 S	--	7.6	1464	--	--	--	--	0	261	--	262	42	--	--	--		676						
6-27-51									4.28		7.39	0.68											
16S/ 1E- 6O 3 S	--	8.2	1185	--	--	--	--	0	239	--	244	116	--	--	--		436						
6-27-51									3.92		6.88	1.87											
16S/ 1E- 6R 1 S	--	8.2	1266	--	--	--	--	0	275	--	190	56	--	--	--		332						
6-27-51									4.51		5.36	0.90											
16S/ 1E- 7A 1 S	--	7.8	1536	91	55	140	--	0	244	145	285	43	--	0.40	--		453						
6-20-51				4.54	4.52	6.09			4.00	3.02	8.04	0.69											
				30	30	40			25	19	51	4					989 879						
16S/ 1E- 7C 1 S	--	7.4	1529	--	--	--	--	0	229	--	315	67	--	--	--		444						
5-17-51									3.75		8.88	1.08											
16S/ 1E- 7C 3 S	--	7.7	1970	129	75	178	3	0	296	123	402	72	0.2	0.53	59	1190	631						
5-17-51				6.44	6.17	7.74	0.08		4.85	2.56	11.34	1.16											
				32	30	38			24	13	57	6					1187						
16S/ 1E- 7C 4 S	--	7.5	2049	--	--	--	--	0	349	--	400	101	--	--	--		624						
6-20-51									5.72		11.28	1.63											
16S/ 1E- 7C 6 S	--	8.2	1454	--	--	--	--	0	275	--	254	44	--	--	--		392						
6-20-51									4.51		7.16	0.71											
16S/ 1E- 7O 1 S	--	7.5	2090	138	87	178	3	0	339	142	415	59	0.1	0.77	56	1240	703						
5-15-51				6.89	7.15	7.74	0.08		5.56	2.96	11.70	0.95											
				32	33	35			26	14	55	4					1245						
16S/ 1E- 7E 1 S	--	--	3436	--	--	--	--	0	217	--	940	120	--	--	--								
5-16-51									3.56		28.51	1.94											
16S/ 1E- 7E 3 S	--	8.2	1600	--	--	--	--	0	266	--	350	48	--	--	--		436						
5-15-51									4.36		9.87	0.77											
16S/ 1E- 7E 5 S	--	--	1155	--	--	--	--	0	220	--	225	34	--	--	--								
5-15-51									3.61		6.35	0.55											
16S/ 1E- 7M 1 S	--	7.1	3268	224	160	214	--	0	230	188	799	234	--	0.06	--		1218						
5-16-51				11.18	13.16	9.30			3.77	3.91	22.53	3.77											
				33	39	28			11	12	66	11					3268 1932						
16S/ 1E- 7M 2 S	--	7.3	2865	172	124	213	--	0	186	126	753	86.8	--	0.03	--		940						
5-16-51				8.58	10.20	9.26			3.05	2.62	21.23	1.40											
				31	36	33			11	9	75	5					2552 1566						

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date sampled																	

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT									20700					
16S/ 1E- 7M 3 S	--	--	3496	--	--	--	--	0	215	--	930	130	--	--	--			
5-16-51									3.52		26.23	2.10						
16S/ 1E- 7M 4 S	--	--	3257	--	--	--	--	0	249	--	725	249	--	--	--			
5-16-51									4.08		20.45	4.02						
16S/ 1E- 7M 5 S	--	--	2433	--	--	--	--	0	207	--	600	84	--	--	--			
5-15-51									3.39		16.92	1.35						
16S/ 1E- 7M 6 S	--	--	2262	--	--	--	--	0	195	--	510	131	--	--	--			
5-15-51									3.20		14.38	2.11						
16S/ 1E- 7N 1 S	--	7.7	1146	58	48	96	--	0	237	78	157	76	--	0	--		342	
5-16-51				2.89	3.95	4.17			3.88	1.62	4.43	1.23				665		
				26	36	38			35	15	40	11				630		
16S/ 1E- 7P 1 S	--	7.8	1750	107	76	143	4	0	246	132	295	170	0.2	0.33	52	1100	580	
5-16-51				5.34	6.25	6.22	0.10		4.03	2.75	8.32	2.74						
				30	35	35	1		23	15	47	15				1100		
16S/ 1E- 8B 2 S	--	8.1	1450	97	51	138	4	0	242	188	248	1.8	0.3	0.33	42	890	452	
6-25-51				4.84	4.19	6.00	0.10		3.97	3.91	6.99	0.03						
				32	28	40	1		27	26	47					889		
16S/ 1E- 8D 2 S	--	8.1	1480	100	53	152	3	0	284	184	200	95	0.2	0.61	59	986	468	
6-21-51				4.99	4.36	6.61	0.08		4.65	3.83	5.04	1.53						
				31	27	41			30	24	36	10				986		
16S/ 1E- 8O 5 S	--	7.3	1419	84	48	135	--	0	268	143	195	84	--	0	--		407	
6-20-51				4.19	3.95	5.85			4.39	2.98	5.50	1.35				881		
				30	28	42			31	21	39	9				821		
16S/ 1E- 8M 1 S	--	8.6	1949	42	38	100	3	10	159	109	115	52	0.9	0.11	58	606	262	
7-11-51				2.10	3.13	4.35	0.08	0.33	2.61	2.27	3.24	0.84						
				22	32	45	1	4	28	24	35	9				606		
15S/ 1W- 1A 1 S	--	7.6	805	18	32	129	9	0	165	30	190	7.4	1.5	0.06	68	532	177	
2-18-59				0.90	2.63	5.61	0.23		2.70	0.62	5.30	0.12						
				10	28	60	2		31	7	61	1				566		
15S/ 1W- 1J 2 S	65	7.1	751	32	19	83	2	0	180	35	119	5	0.2	0.40	19	501	158	
3-13-59				1.60	1.56	3.61	0.05		2.95	0.73	3.30	0.00						
				23	23	53	1		41	10	47	1				403		
15S/ 1W- 1J 7 S	--	7.2	826	36	25	103	--	0	146	60	159	15	0.5	--	28	572	193	
7- 9-56				1.80	2.06	4.48			2.39	1.25	4.48	0.24						
				22	25	54			29	15	54	3				498		
15S/ 1W- 1R 1 S	--	7.5	900	50	18	96	3	0	171	48	163	2.8	1.0	0.05	43	520	199	
6-21-60				2.50	1.48	4.26	0.08		2.80	1.00	4.60	0.05						
				30	18	51	1		33	12	54	1				511		
15S/ 1W- 1R 2 S	--	8.0	891	40	26	100	1	0	161	53	164	5.5	0.3	0.06	30	530	207	
2-19-59				2.00	2.14	4.35	0.03		2.64	1.10	4.62	0.09						
				23	25	51			31	13	55	1				499		
15S/ 1W-11G 1 S	--	7.8	916	53	41	97	4	0	189	68	156	86	0.3	0.12	46	635	301	
2-17-59				2.64	3.37	4.22	0.10		3.10	1.42	4.40	1.39						
				26	33	41	1		30	14	43	13				644		
15S/ 1W-13E 1 S	--	6.9	1585	108	60	145	6	0	296	123	262	82	0.4	0.07	51	1031	516	
2-18-59				5.39	4.93	6.30	0.15		4.85	2.56	7.39	1.32						
				32	29	38	1		30	16	46	8				983		
15S/ 1W-13J 1 S	--	7.5	--	117	59	104	4	0	201	160	285	0	0.2	--	--		535	
10- 7-59				5.84	4.85	4.52	0.10		3.29	3.33	8.04					1110		
				38	32	30	1		22	23	55					828		
15S/ 1W-13J 2 S	--	7.3	--	108	53	130	4	0	222	217	243	0.0	0.2	--	--		488	
10- 7-59				5.39	4.36	5.65	0.10		3.64	4.52	6.85					1040		
				35	28	36	1		24	30	46					864		
15S/ 1W-13J 3 S	--	7.5	--	93	47	144	4	0	212	257	194	0.2	0.2	--	--		426	
10- 7-59				4.64	3.87	6.26	0.10		3.47	5.35	5.47							
				31	26	42	1		24	37	38					975		
																844		
15S/ 1W-13N 3 S	--	7.4	1350	87	46	142	2	0	206	158	248	35	0.2	0.18	27	876	406	
11- 7-63				4.34	3.78	6.17	0.05		3.38	3.29	6.99	0.56						
				30	26	43			24	23	49	4				847		
15S/ 1W-13O 1 S	--	8.0	1060	76	36	86	3	0	192	81	197	2.5	0.6	0.03	40	606	338	
2-25-60				3.79	2.96	3.74	0.08		3.15	1.69	5.56	0.04						
				36	28	35	1		30	16	53					617		
15S/ 1W-14O 1 S	87	7.2	2049	114	70	215	2	--	173	58	515	131	0.6	0.14	30	1450	573	
9-17-58				5.69	5.76	9.35	0.05		2.84	1.21	14.52	2.11						
				27	28	45			14	6	70	10				1221		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃
Date sampled																	

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT														Z0700			
Z07A0																					
15S/ 1W-15G 1 S	--	7.7	1030	48	36	111	2	0	262	39	170	25	0.7	--	--	614	268				
2-25-60				2.40	2.46	4.83	0.05		4.29	0.81	4.19	0.40				561					
				23	29	47			42	8	47	4									
15S/ 1W-17B 1 S	--	6.9	963	43	31	94	2	0	68	119	188	5	0.6	0.02	27	630	235				
1-17-64				2.15	2.55	4.09	0.05		1.11	2.48	5.30	0.08				543					
				24	29	46	1		12	28	59	1									
15S/ 1W-22D 1 S	69	5.9	2225	52	34	356	2	0	27	103	624	3.1	0.9	0.09	14	1254	270				
2-25-60				2.59	2.80	15.48	0.05		0.44	2.14	17.60	0.05				1202					
				12	13	74			2	11	87										
15S/ 1W-22G 1 S	--	7.2	1251	52	34	130	2	0	222	33	222	31	0.6	0.34	36	800	270				
6- 2-60				2.59	2.80	5.65	0.05		3.84	0.69	6.48	0.00				650					
				23	25	51			33	6	56	5									
15S/ 1W-22P 1 S	68	4.7	3800	387	190	322	8	0	6	1727	429	2.5	1.0	0.03	43	3247	1748				
2-25-60				19.31	15.63	14.00	0.20		0.10	35.96	12.10	0.04				3112					
				39	32	28				75	25										
15S/ 1W-22O 1 S	--	7.3	2169	199	89	135	5	0	179	672	246	1	0.3	0	40	1523	863				
2-24-60				9.93	7.32	5.87	0.13		2.93	13.99	6.99	0.02				1477					
				43	31	25	1		12	58	29										
15S/ 1W-22Q 2 S	--	7.0	2646	243	118	175	5	0	234	700	390	0	0.4	0.30	29	1785	1092				
6-25-58				12.13	9.70	7.61	0.13		3.84	14.57	11.00					1776					
				41	33	26			13	50	37										
15S/ 1W-23H 4 S	--	6.3	1750	181	89	82	5	0	99	764	92	0	0.2	0.10	21	1270	818				
6- 2-60				9.03	7.32	3.57	0.13		1.62	15.91	2.59					1283					
				45	37	18	1		8	79	13										
15S/ 1W-23H 5 S	--	7.3	2291	275	134	110	6	0	37	1278	78	0.0	0.6	0.09	30	2094	1238				
4- 8-59				13.72	11.02	4.78	0.15		0.61	26.61	2.20					1930					
				46	37	16	1		2	90	7										
15S/ 1W-23P 1 S	--	6.9	1924	185	92	113	4	0	133	717	150	0	0.1	0.08	20	1375	841				
6- 2-60				9.23	7.57	4.91	0.10		2.18	14.93	4.40					1352					
				42	35	23			10	69	20										
15S/ 1W-24C 4 S	--	7.1	1870	144	74	136	4	0	216	366	300	1	0.3	0.18	24	1275	665				
6- 2-60				7.19	6.09	5.91	0.10		3.54	7.62	8.46	0.02				1156					
				37	32	31	1		18	39	43										
15S/ 1W-24C 5 S	70	7.9	1811	142	64	146	5	0	242	312	302	3	0.5	0.32	32	1240	618				
1-31-62				7.09	5.26	6.35	0.13		3.97	6.50	8.52	0.05				1126					
				38	28	34	1		21	34	45										
15S/ 1W-24C 6 S	--	8.3	--	131	59	124	3	0	207	248	276	0.3	0.3	--	--	570					
10- 7-59				6.54	4.85	5.39	0.08		3.39	5.16	7.76					1210					
				39	29	32			21	32	48					943					
15S/ 1W-24C 7 S	--	7.6	--	167	79	124	5	0	177	366	341	0	0.2	--	--	742					
10- 7-59				8.33	6.50	5.39	0.13		2.90	7.62	9.62					1545					
				41	32	26	1		14	38	48					1169					
15S/ 1W-24C 9 S	68	7.8	1730	176	34	167	4	0	262	272	311	5.1	0.2	0.18	28	1286	579				
11- 7-63				8.78	2.80	7.26	0.10		4.29	5.66	8.77	0.08				1126					
				46	15	38	1		23	30	47										
15S/ 1W-24C11 S	--	6.5	--	59	25	89	--	--	220	84	124	--	--	0	25	520	250				
1-22-48				2.94	2.06	3.87			3.61	1.75	3.50										
15S/ 1W-24D 1 S	--	7.1	--	82	46	186	--	--	321	133	282	--	--	0	37	930	394				
1-22-48				4.09	3.78	8.09			5.26	2.77	7.95										
15S/ 1W-24D 2 S	--	--	--	65	30	102	--	0	292	89	125	0	--	--	15	647	286				
8- 9-27				3.24	2.47	4.43			4.79	1.85	3.53					570					
				32	24	44			47	18	35										
15S/ 1W-24D 3 S	--	--	--	77	34	118	--	0	261	114	170	0	--	--	20	744	332				
6-11-27				3.84	2.80	5.13			4.61	2.37	4.77					671					
				33	24	44			39	20	41										
15S/ 1W-24D 5 S	69	--	2380	186	91	197	5	0	244	511	383	2.5	0.8	0.04	27	1559	839				
2-25-60				9.28	7.48	8.57	0.13		4.00	10.64	10.00	0.04				1525					
				36	29	34	1		16	42	42										
15S/ 1W-24D 7 S	--	6.9	--	71	34	136	--	--	283	139	168	--	--	0	37	730	317				
1-22-48				3.54	2.80	5.91			4.64	2.89	4.74										
15S/ 1W-24D 9 S	--	7.4	--	142	67	136	5	0	107	425	293	0.1	0.3	--	--	651					
10- 7-59				7.09	5.51	6.00	0.13		1.75	6.85	8.26					1360					
				38	29	32	1		9	47	44					1123					
15S/ 1W-24J 1 S	74	7.1	2113	140	85	151	4	0	196	210	446	21	0.3	0.10	27	1366	700				
6- 2-60				6.99	6.99	6.57	0.10		3.21	4.37	12.56	0.34				1181					
				34	34	32			16	21	61	2									

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃	
Date sampled																		

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT										ZOTAO					
15S/ 1W-25F 1 S 2-18-59	--	7.4	2775	167 8.33 29	133 10.94 38	213 9.26 32	2 0.05	0	256 4.20 14	428 8.91 30	479 13.51 46	184 2.97 10	0.3	0.06	56	1924 1788	964		
15S/ 1W-25J 1 S 2-18-59	--	7.9	950	52 2.59 30	23 1.89 22	90 3.91 45	11 0.28 3	0	98 1.61 18	70 1.46 16	186 5.25 59	34 0.55 6	0.8	0.05	41	597 556	224		
15S/ 1W-278 2 S 7- 8-53	--	7.2	1851	152 7.58 35	77 6.33 29	180 7.83 36	5 0.13 1	0	261 4.28 20	441 9.18 43	280 7.90 37	6.0 0.10	0.6	0.08	--	1401 1270	696		
15S/ 1W-27G 1 S 7-22-58	--	7.6	1788	106 5.29 29	60 4.93 27	188 8.17 44	3 0.08	0	355 5.82 32	179 3.73 20	305 8.60 47	15 0.24 1	0.2	0	49	1122 1080	511		
15S/ 1W-27G 5 S 9-17-58	84	7.4	596	49 2.45 40	18 1.48 24	50 2.17 35	4 0.10 2	--	129 2.11 34	120 2.50 41	53 1.49 24	2.5 0.04 1	0.3	0.06	10	380 370	197		
15S/ 1W-27G 6 S 6- 2-60	--	7.8	985	78 3.89 40	26 2.14 22	83 3.61 37	6 0.15 2	0	148 2.43 25	237 4.93 51	80 2.26 23	2 0.03	0.3	0.08	11	675 596	302		
15S/ 1W-27G 7 S 4-19-62	--	7.9	864	40 2.00 24	28 2.30 28	88 3.83 47	2 0.05 1	0	173 2.84 35	47 0.98 12	130 3.67 45	44 0.71 9	0.5	0.12	64	515 529	215		
15S/ 1W-27L 1 S 1-12-51	--	7.2	1449	70 3.49 29	45 3.70 30	114 4.96 41	--	0	132 2.16 18	35 0.73 6	269 7.59 63	93 1.50 13	--	0	--	1195 691	360		
15S/ 1W-27N 1 S 6- 2-60	74	7.4	1875	133 6.64 37	60 4.93 28	144 6.26 35	3 0.08	0	340 5.57 29	31 0.65 3	439 12.38 65	28 0.45 2	0.4	0.22	38	1245 1044	579		
15S/ 1W-28G 1 S 6- 1-60	73	7.0	2857	156 7.78 28	97 7.98 29	271 11.78 43	4 0.10	0	288 4.72 17	136 2.83 10	684 19.29 71	31 0.50 2	0.2	0.18	51	1870 1572	789		
15S/ 1W-28K 2 S 6- 1-60	--	7.1	2557	158 7.88 31	85 6.99 27	242 10.52 41	4 0.10	0	263 4.31 17	102 2.12 8	658 18.56 72	41 0.66 3	0.3	0.14	40	1670 1460	744		
15S/ 1W-28L 1 S 9-17-58	70	7.0	3690	255 12.72 31	127 10.44 25	410 17.83 43	2 0.05	--	337 5.52 14	171 3.56 9	1110 31.30 77	26 0.42 1	0.6	0.14	60	2920 2327	1159		
15S/ 1W-28Q 2 S 6- 2-60	72	7.1	3692	220 10.98 30	129 10.61 29	331 14.39 40	1 0.03	0	307 5.03 14	74 1.54 4	1060 29.89 82	0	0.4	0.20	29	2355 1996	1080		
15S/ 1W-28Q 3 S 11- 7-63	--	7.7	2550	140 6.99 25	63 5.18 19	355 15.44 56	3 0.08	0	409 6.70 25	164 3.41 12	602 16.98 62	13 0.21 1	0.2	0.55	35	1630 1577	609		
15S/ 1W-28R 1 S 6- 2-60	--	7.3	3250	201 10.03 30	134 11.02 33	292 12.70 38	4 0.10	0	372 6.10 18	134 2.79 8	881 24.84 74	2 0.03	0.3	0.22	30	2150 1861	1053		
15S/ 1W-28R 2 S 6- 2-60	--	7.1	3011	190 9.48 32	89 7.32 25	294 12.78 43	6 0.15 1	0	315 5.16 18	176 3.66 13	706 19.91 68	26 0.42 1	0.4	0.48	40	1955 1683	841		
15S/ 1W-28R 4 S 7- 5-51	--	7.9	2227	--	--	--	--	0	298 4.88	--	535 15.09	24 0.39	--	--	--		552		
15S/ 1W-29M 1 S 10-23-58	69	7.1	3236	292 14.57 42	117 9.62 28	235 10.22 30	5 0.13	0	227 3.72 11	45 0.94 3	1000 28.20 84	52 0.84 2	0.6	0.06	30	2990 1888	1210		
15S/ 1W-29Q 1 S 6- 1-60	69	7.6	479	45 2.25 48	11 0.90 19	30 1.30 28	9 0.23 5	0	144 2.36 54	49 1.02 23	31 0.87 20	10 0.16 4	0.1	0.14	22	330 278	158		
15S/ 1W-30K 1 S 6- 1-60	69	7.6	1116	53 2.64 26	40 3.29 32	95 4.13 40	7 0.18 2	0	154 2.52 25	63 1.31 13	224 6.32 62	1 0.02	0.2	0.16	17	710 576	297		
15S/ 1W-30K 2 S 11- 7-63	--	7.4	920	58 2.89 31	23 1.89 20	104 4.52 48	3 0.08 1	0	202 3.31 36	68 1.42 15	152 4.29 47	9.7 0.16 2	0.4	0.25	25	586 543	239		
15S/ 1W-30K 3 S 6- 1-60	--	7.5	604	23 1.15 23	15 1.23 24	60 2.61 52	2 0.05 1	0	77 1.26 26	11 0.23 5	102 2.88 60	27 0.44 9	0.1	0.04	29	335 307	119		
15S/ 1W-30M 1 S 4- 8-59	--	7.0	789	41 2.05 27	28 2.30 30	74 3.22 42	4 0.10 1	--	146 2.39 32	45 0.94 12	144 4.06 54	12 0.19 3	0.5	0.05	60	516 480	218		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS 180°C Evap. 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

LOWER SAN DIEGO HYDRO SUBUNIT

207A0

SAN DIEGO HYDRO UNIT

20700

15S/ 1W-33A 1 S 6- 2-60	72	7.9	4007	233 11.63 28	124 10.20 25	437 19.00 46	2 0.05	0	462 7.57 19	191 3.98 10	1028 26.99 71	3 0.05	0.3	0.46	46	2640 2294	1092
15S/ 1W-33B 1 S 12- 7-60	67	7.3	4030	235 11.73 29	115 9.46 23	448 19.48 48	1 0.03	0	372 6.10 15	211 4.39 11	1046 29.50 73	12 0.19	0.4	0.62	33	2486 2285	1060
15S/ 1W-33C 1 S 10-23-58	--	6.9	2822	217 10.83 39	105 8.64 31	191 8.30 30	7 0.18 1	--	88 1.44 5	57 1.19 4	788 22.22 60	167 3.02 11	0.1	0	40	2428 1635	974
15S/ 1W-34D 2 S 6- 2-60	--	7.4	2617	167 8.33 33	88 7.24 29	214 9.30 37	4 0.10	0	304 4.98 21	48 1.00 4	636 17.94 74	19 0.31 1	0.4	0.12	39	1660 1365	779
15S/ 1W-34M 1 S 12- 6-60	68	7.2	3050	184 9.18 30	56 4.61 15	378 16.44 54	2 0.05	0	395 6.47 22	197 4.10 14	683 19.26 64	15 0.24 1	0.4	0.82	37	2852 1747	690
15S/ 1W-34M 2 S 6- 4-62	69	7.9	2280	149 7.44 32	71 5.84 25	230 10.00 43	5 0.13 1	0	318 5.21 22	143 2.98 13	531 14.97 64	8.6 0.14 1	0.2	0.55	33	1520 1328	665
15S/ 1W-34P 1 S 5- 1-51	--	7.3	3135	198 9.88 31	107 8.80 28	292 12.70 40	--	0	335 5.49 17	106 2.21 7	850 23.97 73	73.4 1.18 4	--	0.10	--	2725 1791	935
15S/ 1W-34O 1 S 5- 1-51	--	7.6	2650	157 7.83 28	102 8.39 30	265 11.52 41	2 0.05	0	272 4.46 17	87 1.81 7	668 18.64 73	39 0.63 2	0.2	0.08	64	1520 1516	812
15S/ 1W-34R 1 S 4-25-51	--	7.8	1850	107 5.34 30	57 4.69 26	176 7.65 43	2 0.05	0	182 2.98 17	75 1.56 9	435 12.27 70	49 0.79 4	0.4	0.43	63	1050 1054	502
15S/ 1W-34R 2 S 5- 1-51	--	7.2	1831	--	--	--	--	0	200 3.28	--	465 13.11	48 0.77	--	--	--	480	
15S/ 1W-34R 3 S 7-10-57	--	7.2	1880	120 5.99 30	70 5.76 28	193 8.39 41	3 0.08	0	153 2.51 12	191 3.98 19	466 13.14 64	64.4 1.04 5	0.1	0	--	1376 1183	568
15S/ 1W-34R 4 S 5- 2-51	--	7.4	2049	--	--	--	--	0	195 3.20	--	530 14.95	56 0.90	--	--	--	612	
15S/ 1W-34R 5 S 5- 2-51	--	7.4	1709	--	--	--	--	0	164 2.69	--	426 12.01	58 0.94	--	--	--	508	
15S/ 1W-35N 1 S 4-25-51	--	7.1	1770	107 5.34 32	68 5.59 34	130 5.65 34	--	0	127 2.08 12	39 0.81 5	445 12.55 75	75 1.21 7	--	0.03	--	1384 926	547
15S/ 1W-35N 2 S 4-25-51	--	7.1	1324	--	--	--	--	0	169 2.77	--	290 8.18	58 0.94	--	--	--	316	
15S/ 1W-36O 1 S 4-23-51	--	7.4	1976	126 6.29 33	78 6.41 33	152 6.61 34	--	0	217 3.56 17	180 3.75 18	412 11.62 57	93 1.50 7	--	0.08	--	1360 1148	636
15S/ 1W-36R 1 S 4- 9-51	--	7.5	1739	118 5.89 35	61 5.02 30	137 5.96 35	--	0	207 3.39 20	141 2.94 17	310 8.74 51	119 1.92 11	--	0	--	1192 988	546
15S/ 2W-25H 1 S 7- 7-53	--	7.7	1869	79 3.94 19	70 5.76 28	250 10.87 53	5 0.13 1	0	137 2.25 11	138 2.87 14	540 15.23 75	2.5 0.04	0.7	0.10	--	1335 1153	485
15S/ 2W-25J 1 S 6- 1-60	--	7.1	906	32 1.60 19	27 2.22 26	107 4.65 54	4 0.10 1	0	188 3.08 35	44 0.92 10	142 4.00 45	51 0.82 9	0.3	0	28	615 528	191
15S/ 2W-30K 1 S 2-24-60	66	6.7	790	41 2.05 5	23 1.89 4	920 40.00 91	4 0.10	0	104 1.70 22	102 2.12 27	106 2.99 38	60 0.97 12	0.6	0.25	32	484 1340	197
15S/ 2W-35RS1 S 2-24-60	--	7.1	1940	102 5.09 37	2 0.16 1	195 8.48 62	1 0.03	0	299 4.90 26	122 2.54 13	408 11.51 61	3.7 0.06	0.8	0.08	73	1096 1055	263
15S/ 3W-36L 1 S 2-23-60	--	7.8	1940	85 4.24 22	40 3.29 17	274 11.91 60	10 0.26 1	0	403 6.61 34	147 3.06 16	344 9.70 50	1.9 0.03	0.7	0.23	18	1092 1119	377
16S/ 1W- 18 1 S 4-23-51	--	7.2	2469	--	--	--	--	0	242 3.97	--	470 13.25	270 4.36	--	--	--	888	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

LOWER SAN DIEGO HYDRO SUBUNIT				Z07A0				SAN DIEGO HYDRO UNIT										Z0700			
16S/ 1W- 18 2 S	--	7.3	1333	93	52	114	--	0	281	152	160	125	--	0.04	--		446				
4-23-51				4.64	4.28	4.96			4.61	3.16	4.51	2.02				904					
				33	31	36			32	22	32	14				834					
16S/ 1W- 18 3 S	--	7.3	1320	88	44	125	2	0	306	147	129	104	--	0.09	54	844	401				
4- 9-51				4.39	3.62	5.44	0.05		5.02	3.06	3.64	1.68									
				33	27	40			37	23	27	13				843					
16S/ 1W- 18 4 S	--	7.5	736	51	25	60	1	0	160	93	63	54	--	0.18	62	487	230				
4- 9-51				2.54	2.06	2.61	0.03		2.62	1.94	1.78	0.87				488					
				35	28	36			36	27	25	12									
16S/ 1W- 1E 1 S	--	7.4	1950	125	72	150	3	0	274	94	358	128	--	0.13	61	1126	608				
4-11-51				6.24	5.92	6.52	0.08		4.49	1.96	10.10	2.06									
				33	32	35			24	11	54	11				1126					
16S/ 1W- 1G 1 S	--	7.3	1850	174	63	187	2	0	282	416	231	125	0.2	0.12	43	1478	694				
11- 6-63				8.68	5.18	8.13	0.05		4.62	8.66	6.51	2.02									
				39	24	37			21	40	30	9				1380					
16S/ 1W- 1G 2 S	--	7.2	1970	127	71	155	2	0	234	202	272	206	--	0.05	58	1210	609				
4- 8-51				6.34	5.84	6.74	0.05		3.84	4.21	7.67	3.32									
				33	31	36			20	22	40	17				1206					
16S/ 1W- 1G 3 S	--	7.4	2160	154	79	180	3	0	324	193	358	153	--	0.06	60	1340	710				
4-10-51				7.68	6.50	7.83	0.08		5.31	4.02	10.10	2.47									
				35	29	35			24	18	46	11				1339					
16S/ 1W- 1G 5 S	--	7.7	1418	99	49	121	--	0	273	109	161	116	--	0.04	--		449				
4-10-51				4.94	4.03	5.26			4.47	2.27	5.10	1.90				935					
				35	28	37			33	17	37	14				811					
16S/ 1W- 1H 1 S	--	7.3	1923	140	80	127	--	0	264	136	334	120	--	0.03	--		679				
4-10-51				6.99	6.58	5.52			4.33	2.83	9.42	1.94				1290					
				37	34	29			23	15	51	10				1067					
16S/ 1W- 1H 4 S	--	7.2	1500	113	70	127	2	0	281	237	195	87	0.1	0.30	28	1320	570				
10-22-57				5.64	5.76	5.52	0.05		4.61	4.93	5.50	1.40									
				33	34	33			28	30	33	9				998					
16S/ 1W- 1H 7 S	--	7.5	1340	98	55	100	1	0	260	135	161	101	--	0.08	53	832	471				
4- 8-51				4.89	4.52	4.35	0.03		4.26	2.81	4.54	1.63									
				35	33	32			32	21	34	12				832					
16S/ 1W- 1K 1 S	--	7.6	1650	104	65	125	2	0	201	83	340	68	--	0.10	59	945	527				
4-10-51				5.19	5.35	5.44	0.05		3.29	1.73	9.59	1.10									
				32	33	34			21	11	61	7				945					
16S/ 1W- 1M 1 S	--	7.3	1540	88	47	145	2	0	215	66	305	71	--	0.13	55	885	413				
4-11-51				4.39	3.87	6.30	0.05		3.52	1.37	8.60	1.15									
				30	26	43			24	9	59	8				885					
16S/ 1W- 1M 2 S	--	7.3	1380	74	41	140	1	0	193	66	260	78	--	0.12	60	816	353				
4-11-51				3.69	3.37	6.09	0.03		3.16	1.37	7.33	1.26									
				28	26	46			24	10	56	10				815					
16S/ 1W- 1M 4 S	--	7.5	1670	104	63	130	1	0	267	95	315	52	--	0.39	50	942	519				
4-10-51				5.19	5.18	5.65	0.03		4.38	1.98	8.88	0.84									
				32	32	35			27	12	55	5				942					
16S/ 1W- 2A 1 S	--	7.2	1960	112	71	175	2	0	240	141	358	146	--	0.09	59	1180	572				
4-11-51				5.59	5.84	7.61	0.05		3.93	2.94	10.10	2.35									
				29	31	40			20	15	52	12				1182					
16S/ 1W- 2A 2 S	--	7.3	2040	124	76	175	2	0	286	151	370	104	--	0.08	58	1200	622				
4-18-51				6.19	6.25	7.61	0.05		4.69	3.14	10.43	1.68									
				31	31	38			24	16	52	8				1201					
16S/ 1W- 2A 3 S	--	7.4	1810	119	70	160	2	0	373	174	246	123	--	0.18	53	1130	585				
4-18-51				5.94	5.76	6.96	0.05		6.11	3.62	6.99	1.98									
				32	31	37			33	19	37	11				1133					
16S/ 1W- 2A 4 S	--	7.4	1480	100	59	125	3	0	348	139	175	101	--	0.12	53	926	492				
4-18-51				4.99	4.85	5.44	0.08		5.70	2.89	4.94	1.63									
				32	32	35	1		38	19	33	11				926					
16S/ 1W- 2A 5 S	--	7.5	1060	66	43	95	3	0	325	85	98	58	--	0.20	52	660	342				
4-18-51				3.29	3.54	4.13	0.08		5.33	1.77	2.76	0.94									
				30	32	37	1		49	16	26	9				660					
16S/ 1W- 2A 6 S	--	7.3	1650	96	61	140	1	0	241	67	318	104	--	0.11	56	962	491				
4-12-51				4.79	5.02	6.09	0.03		3.95	1.39	8.97	1.68									
				30	32	38			25	9	56	11				962					
16S/ 1W- 2A 7 S	--	7.6	1670	101	63	119	2	0	256	62	315	88	--	0.14	58	934	511				
4-12-51				5.04	5.18	5.17	0.05		4.20	1.29	8.88	1.42									
				33	34	33			27	8	56	9				934					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million					
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT								20700					
165/ 1W- 2A 8 S	--	7.6	1590	93	59	125	2	0	239	58	305	77	--	0.14	54	890	475
4-12-51				4.64	4.85	5.44	0.05		3.92	1.21	0.60	1.24					841
				31	32	36			26	8	57	8					
165/ 1W- 2A 9 S	--	8.0	1030	99	62	120	2	0	242	56	315	86	--	0.16	59	918	502
4-16-51				4.94	5.10	5.22	0.05		3.97	1.17	8.88	1.39					918
				32	33	34			26	8	58	9					
165/ 1W- 2A10 S	--	7.7	1660	98	62	145	2	0	247	65	318	125	--	0.16	59	995	500
4-16-51				4.89	5.10	6.30	0.05		4.05	1.35	8.97	2.02					996
				30	31	39			25	8	55	12					
165/ 1W- 2A12 S	--	7.3	1290	69	46	115	1	0	211	60	238	55	--	0.08	57	745	361
4-16-51				3.44	3.78	5.00	0.03		3.46	1.25	6.71	0.89					745
				26	31	41			28	10	55	7					
165/ 1W- 2A13 S	--	7.6	1310	75	49	115	1	0	221	88	215	76	--	0.08	54	782	389
4-16-51				3.74	4.03	5.00	0.03		3.62	1.83	6.06	1.23					782
				29	31	39			28	14	48	10					782
165/ 1W- 2A15 S	--	8.1	1700	121	75	119	3	0	340	186	228	85	--	0.20	58	1040	611
4-12-51				6.04	6.17	5.17	0.08		5.57	3.91	6.43	1.37					1044
				35	35	30			32	23	37	8					
165/ 1W- 2A16 S	--	7.9	1370	89	54	126	3	0	322	133	167	73	--	0.14	54	857	444
4-18-51				4.44	4.44	5.48	0.08		5.28	2.77	4.71	1.18					857
				31	31	38	1		38	20	34	8					
165/ 1W- 2A18 S	--	7.6	1240	78	51	105	4	0	349	107	127	74	--	0.17	57	775	404
4-18-51				3.89	4.19	4.57	0.10		5.72	2.23	3.58	1.19					775
				31	33	36	1		45	18	28	9					
165/ 1W- 2B 2 S	--	7.6	1130	57	37	110	2	0	185	48	231	5.5	--	0.05	29	610	294
4-17-51				2.84	3.04	4.78	0.05		3.03	1.00	6.51	0.09					610
				27	28	45			29	9	61	1					
165/ 1W- 2D 1 S	--	7.5	1912	103	62	196	--	0	164	104	487	47.7	--	0.11	--		512
4-24-51				5.14	5.10	8.52			2.69	2.17	13.17	0.77					1462
				27	27	45			14	12	70	4					1060
165/ 1W- 2D 2 S	--	--	1658	--	--	--	--	0	159	--	395	41	--	--	--		
4-24-51									2.61		11.14	0.66					
165/ 1W- 2D 3 S	--	--	1577	--	--	--	--	0	156	--	385	43	--	--	--		
4-25-51									2.56		10.86	0.69					
165/ 1W- 2D 4 S	--	7.2	1650	89	46	161	--	0	158	46	374	54	--	0.06	--		411
4-25-51				4.44	3.78	7.00			2.59	0.96	10.55	0.87					1142
				29	25	46			17	6	70	6					848
165/ 1W- 2D 5 S	--	7.5	1430	83	50	105	3	0	120	36	330	44	--	0.20	58	768	413
4-17-51				4.14	4.11	4.57	0.08		1.97	0.75	9.31	0.71					768
				32	32	35	1		15	6	73	6					
165/ 1W- 2D 6 S	--	7.2	1640	92	53	150	1	0	183	48	370	87	--	0.10	67	938	448
4-17-51				4.59	4.36	6.52	0.03		3.00	1.00	10.43	1.08					938
				30	28	42			19	6	67	7					
165/ 1W- 2D 7 S	--	7.4	1374	86	50	123	--	0	134	42	380	50	--	0.10	--		420
4-25-51				4.29	4.11	5.35			2.20	0.87	10.72	0.81					1182
				31	30	39			15	6	73	6					797
165/ 1W- 2E 1 S	--	8.0	1678	87	45	177	--	0	185	98	373	29	--	0.08	--		402
4- 4-51				4.34	3.70	7.70			3.03	2.04	10.52	0.47					1117
				28	24	49			19	13	66	3					900
165/ 1W- 2E 2 S	--	7.6	1695	--	--	--	--	0	193	--	402	10	--	--	--		416
4-23-51									3.16		11.34	0.16					
165/ 1W- 2E 3 S	--	7.6	1898	--	--	--	--	0	234	--	470	38	--	--	--		492
4-23-51									3.84		13.25	0.61					
165/ 1W- 2E 4 S	--	7.4	1669	85	48	180	--	0	178	87	400	32	--	0.09	--		410
6- 5-51				4.24	3.95	7.83			2.92	1.81	11.28	0.52					1209
				26	25	49			18	11	68	3					940
165/ 1W- 2F 1 S	--	7.4	1810	108	63	115	2	0	255	68	350	8.3	--	0.20	61	901	529
4-17-51				5.39	5.16	5.00	0.05		4.18	1.42	9.87	0.13					901
				35	33	32			27	9	63	1					
165/ 1W- 2F 2 S	--	7.0	1479	79	40	142	--	0	144	37	335	35	--	0.06	--		362
4- 3-51				3.94	3.29	6.17			2.36	0.77	9.45	0.58					1012
				29	25	46			18	6	72	4					739
165/ 1W- 2F 3 S	--	7.9	1430	76	38	140	1	0	142	51	322	32	--	0.10	64	794	346
4- 4-51				3.79	3.13	6.09	0.03		2.33	1.06	9.08	0.52					794
				29	24	47			18	8	70	4					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed
Date sampled																

LOWER SAN DIEGO HYURO SUBUNIT				207A0				SAN DIEGO HYURO UNIT										20700			
16S/ 1W- 2G 1 S	--	7.5	1300	70	37	125	1	0	136	54	289	26	--	0.07	52	721	327				
4-17-51				3.49	3.04	5.44	0.03		2.23	1.12	8.15	0.42									
				29	25	45			19	9	68	4					721				
16S/ 1W- 2G 2 S	--	7.5	1440	83	43	125	1	0	170	49	305	48	--	0.10	58	796	384				
4-17-51				4.14	3.54	5.44	0.03		2.79	1.02	8.60	0.77									
				31	27	41			21	8	65	6					796				
16S/ 1W- 2G 3 S	--	8.1	1390	79	51	120	2	0	153	68	291	50	--	0.14	29	765	407				
4-17-51				3.94	4.19	5.22	0.05		2.51	1.42	6.21	0.81									
				29	31	39			19	11	63	6					765				
16S/ 1W- 2G 4 S	--	7.4	1260	75	42	110	1	0	173	57	239	68	--	0.06	58	736	360				
4-17-51				3.74	3.45	4.78	0.03		2.84	1.19	6.74	1.10									
				31	29	40			24	10	57	9					735				
16S/ 1W- 2H 1 S	--	7.6	1940	114	63	185	2	0	299	79	348	171	--	0.10	60	1170	544				
4-12-51				5.69	5.18	8.04	0.05		4.90	1.64	9.81	2.76									
				30	27	42			26	9	51	14					1169				
16S/ 1W- 2H 2 S	--	8.0	1790	106	63	176	2	0	302	82	325	94	--	0.14	59	1060	524				
4-16-51				5.29	5.18	7.65	0.05		4.95	1.71	9.17	1.52									
				29	29	42			29	10	53	9					1056				
16S/ 1W- 2H 3 S	--	7.8	1430	82	46	140	2	0	204	68	277	56	--	0.16	61	832	394				
4-16-51				4.09	3.78	6.09	0.05		3.34	1.42	7.81	0.90									
				29	27	43			25	11	58	7					832				
16S/ 1W- 2H 4 S	--	7.4	1370	82	46	125	1	0	187	66	270	66	--	0.10	58	806	394				
4-16-51				4.09	3.78	5.44	0.03		3.06	1.37	7.61	1.06									
				31	28	41			23	10	58	8					806				
16S/ 1W- 2J 1 S	--	7.6	1590	93	52	168	2	0	311	118	290	76	--	0.20	56	968	446				
3-27-51				4.64	4.28	7.30	0.05		5.10	2.46	7.05	1.23									
				29	26	45			32	16	45	8					968				
16S/ 1W- 2J 2 S	--	7.5	1410	76	45	125	2	0	178	49	293	42	--	0.13	57	777	375				
3-27-51				3.79	3.70	5.44	0.05		2.92	1.02	8.26	0.68									
				29	29	42			23	8	64	5					777				
16S/ 1W- 2K 2 S	--	7.5	2140	141	76	165	2	0	254	93	430	96	--	0.27	58	1190	665				
3-28-51				7.04	6.25	7.17	0.05		4.16	1.94	12.13	1.55									
				34	30	35			21	10	61	8					1186				
16S/ 1W- 2K 3 S	--	7.7	1780	111	55	155	1	0	188	54	402	76	--	0.14	58	1010	503				
3-28-51				5.54	4.52	6.74	0.03		3.08	1.12	11.34	1.23									
				33	27	40			18	7	68	7					1005				
16S/ 1W- 2K 4 S	--	8.0	2141	122	67	214	--	0	229	102	479	79	--	0.06	--		580				
3-28-51				6.09	5.51	9.30			3.75	2.12	13.51	1.27									
				29	26	44			18	10	65	6					1400 1176				
16S/ 1W- 2K 5 S	--	7.8	1620	98	55	135	3	0	236	77	303	73	--	0.13	56	916	471				
4-17-51				4.89	4.52	5.87	0.08		3.87	1.60	8.54	1.18									
				32	29	38	1		25	11	56	8					916				
16S/ 1W- 2K 6 S	--	7.4	1950	112	62	225	1	0	250	158	399	106	0.2	0.18	43	1396	535				
11- 6-63				5.59	5.10	9.78	0.03		4.10	3.29	11.25	1.71									
				27	25	48			20	16	55	8					1229				
16S/ 1W- 2L 1 S	--	7.6	1640	89	49	170	1	0	201	71	350	89	--	0.23	66	984	424				
3-28-51				4.44	4.03	7.39	0.03		3.29	1.48	9.87	1.44									
				28	25	47			20	9	61	9					984				
16S/ 1W- 2L 3 S	--	7.2	1070	53	20	125	1	0	116	42	245	2.0	--	0.38	15	560	214				
4- 2-51				2.64	1.64	5.44	0.03		1.90	0.87	6.91	0.03									
				27	17	56			20	9	71						560				
16S/ 1W- 2L 4 S	--	8.2	1548	89	43	152	--	0	183	47	339	46	--	0.05	--		399				
4- 2-51				4.44	3.54	6.61			3.00	0.98	9.56	0.74									
				30	24	45			21	7	67	5					1040 806				
16S/ 1W- 2L 5 S	--	8.2	1274	73	26	129	--	10	134	39	277	18	--	0.18	--		289				
4- 2-51				3.64	2.14	5.61		0.33	2.20	0.81	7.81	0.29									
				32	19	49		3	19	7	68	3					818 638				
16S/ 1W- 2L 7 S	--	8.1	1499	74	42	164	--	0	224	48	308	38	--	0.06	--		357				
4- 3-51				3.69	3.45	7.13			3.67	1.00	8.69	0.61									
				26	24	50			26	7	62	4					948 784				
16S/ 1W- 2L 8 S	--	7.6	949	40	14	121	--	0	107	50	205	4.0	--	0.24	--		158				
4- 3-51				2.00	1.15	5.26			1.75	1.04	5.78	0.06									
				24	14	63			20	12	67	1					518 487				
16S/ 1W- 2L 9 S	--	7.2	1506	78	39	156	--	0	234	59	318	24	--	0.10	--		355				
4- 3-51				3.89	3.21	6.78			3.84	1.23	8.97	0.39									
				28	23	49			27	9	62	3					1002 789				
16S/ 1W- 2L11 S	--	7.4	1540	91	43	150	1	0	98	76	330	27	--	0.22	64	880	404				
4- 5-51				4.54	3.54	6.52	0.03		1.61	1.58	9.31	0.44									
				31	24	45			12	12	72	3					830				

State well number	Temp. when	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactivity value									Chemical constituents in parts per million				
	sampled in °F			Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TD5 Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date sampled																	

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT									20700					
207A0																		
165/ 1W- 2L12 S	--	8.0	1530	92	40	145	1	0	156	74	345	26	--	0.21	43	843	394	
4- 3-51				4.59	3.29	6.30	0.03		2.56	1.54	9.73	0.42						
				32	23	44			18	11	68	3				843		
165/ 1W- 2L13 S	--	8.0	1508	78	41	156	--	0	178	45	326	46	--	0.06	--		363	
4- 3-51				3.89	3.37	6.78			2.92	0.94	9.19	0.74				1071		
				28	24	48			21	7	67	5				780		
165/ 1W- 2L14 S	--	7.6	2045	108	61	206	--	0	271	48	491	64	--	0.05	--		521	
4- 4-51				5.39	5.02	8.96			4.44	1.00	12.72	1.03				1407		
				28	26	46			23	5	66	5				1071		
165/ 1W- 2L15 S	--	7.5	1992	114	60	204	--	0	305	50	417	51	--	0.12	--		531	
4- 4-51				5.69	4.93	8.87			5.00	1.04	11.76	0.82				1263		
				29	25	46			27	6	63	4				1046		
165/ 1W- 2L16 S	--	7.4	1282	72	35	128	--	0	161	36	261	16	--	0.20	--		324	
4- 3-51				3.59	2.88	5.57			2.64	0.75	7.92	0.29				867		
				30	24	46			23	6	68	3				649		
165/ 1W- 2L17 S	--	7.7	1026	43	10	130	--	0	117	59	196	2.5	--	0.17	--		149	
1-11-51				2.15	0.82	5.65			1.92	1.23	5.53	0.04				620		
				25	10	66			22	14	63					498		
165/ 1W- 2L18 S	--	7.5	1760	104	53	156	1	0	231	82	362	29	--	0.06	53	974	478	
4- 3-51				5.19	4.36	6.78	0.03		3.79	1.71	10.77	0.47				974		
				32	27	41			23	10	64	3						
165/ 1W- 2M 1 S	--	7.4	2250	130	68	230	1	0	276	98	505	48	--	0.18	72	1290	604	
4- 4-51				6.49	5.59	10.00	0.03		4.52	2.04	14.24	0.77				1288		
				29	25	45			21	9	66	4						
165/ 1W- 2P 1 S	--	7.6	2066	108	63	215	--	0	227	48	520	71	--	0.15	--		529	
4- 3-51				5.39	5.18	9.35			3.72	1.00	14.66	1.15				1542		
				27	26	47			18	5	71	6				1137		
165/ 1W- 2Q 1 S	--	8.1	1565	83	48	157	--	0	220	57	324	57	--	0.11	--		405	
3-28-51				4.14	3.95	6.83			3.61	1.19	9.14	0.92				1000		
				28	26	46			24	8	62	6				834		
165/ 1W- 2Q17 S	--	7.3	1786	94	59	177	--	0	205	66	420	64	--	0.15	--		477	
9-20-51				4.69	4.85	7.70			3.36	1.37	11.64	1.03				1358		
				27	28	45			19	8	67	6				981		
165/ 1W- 2Q24 S	--	7.7	990	46	11	133	--	0	132	56	222	0	--	0.12	--		160	
0- 0-51				2.30	0.90	5.78			2.16	1.17	6.26					613		
				26	10	64			23	12	65					533		
165/ 1W- 3A 1 S	--	7.2	2155	--	--	--	--	0	223	--	565	37	--	--	--		592	
5- 1-51									3.65		15.93	0.60						
165/ 1W- 3A 2 S	--	7.3	1988	--	--	--	--	0	208	--	462	48	--	--	--		536	
4-24-51									3.41		13.03	0.77						
165/ 1W- 3A 4 S	--	--	1709	--	--	--	--	0	178	--	400	41	--	--	--			
4-24-51									2.92		11.28	0.66						
165/ 1W- 3A 5 S	--	7.2	1695	--	--	--	--	0	183	--	415	43	--	--	--		410	
4-24-51									3.00		11.70	0.69						
165/ 1W- 3B 1 S	--	7.3	2564	--	--	--	--	0	239	--	690	60	--	--	--		716	
4-30-51									3.92		19.46	0.97						
165/ 1W- 3B 2 S	--	7.5	2625	171	80	234	--	0	227	66	690	103	--	0.07	--		756	
5- 1-51				8.53	6.58	10.17			3.72	1.37	19.46	1.66				1998		
				34	26	40			14	5	74	6				1456		
165/ 1W- 3B 3 S	--	8.4	2360	148	72	255	0	12	228	121	572	41	0	0.07	54	1390	666	
5- 1-51				7.39	5.92	11.09		0.40	3.74	2.52	16.13	0.66				1387		
				30	24	45		2	16	11	69	3						
165/ 1W- 3B 4 S	--	7.3	2703	181	95	227	--	0	220	78	755	38.7	--	0.16	--		843	
5- 1-51				9.03	7.81	9.87			3.61	1.62	21.29	0.62				2353		
				34	29	37			13	6	76	2				1483		
165/ 1W- 3B 5 S	--	--	2425	--	--	--	--	0	229	--	780	44	--	--	--			
5- 1-51									3.75		22.00	0.71						
165/ 1W- 3B 6 S	--	--	3058	--	--	--	--	0	210	--	820	59	--	--	--			
5- 1-51									3.44		23.12	0.95						
165/ 1W- 3B 7 S	--	7.8	3584	234	116	326	--	0	251	121	990	103	--	0.11	--		1062	
5- 1-51				11.68	9.54	14.17			4.11	2.52	27.92	1.66				3192		
				33	27	40			11	7	77	5				2014		

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

SAN DIEGO HYDRO UNIT																		
Z07A0										Z0700								
LOWER SAN DIEGO HYDRO SUBUNIT																		
165/ 1W- 3C 1 S	--	7.6	3360	230	114	285	2	0	278	82	892	71	0	0.13	55	1870	1044	
5- 1-51				11.48	9.38	12.39	0.05		4.56	1.71	25.15	1.15						
				34	28	37			14	5	77	4						1868
165/ 1W- 3C 2 S	--	7.5	1750	93	38	240	3	0	221	85	446	1.0	0.4	0.14	23	1192	389	
12- 4-62				4.64	3.13	10.44	0.08		3.62	1.77	12.58	0.02						
				25	17	57			20	10	70							1038
165/ 1W- 3E 1 S	74	7.8	1360	75	38	165	3	0	184	59	339	4.0	0.4	0.27	36	880	344	
12- 4-62				3.74	3.13	7.17	0.08		3.02	1.23	9.56	0.06						
				26	22	51	1		22	9	69							810
165/ 1W- 3G 1 S	--	--	2262	--	--	--	--	0	249	--	555	47	--	--	--			
4-24-51									4.08		15.65	0.76						
165/ 1W- 3G 2 S	--	7.3	1930	99	49	209	--	0	256	58	460	25	--	0	--			449
4-24-51				4.94	4.03	9.09			4.20	1.21	12.97	0.40						
				27	22	50			22	6	69	2						1193
																		1026
165/ 1W- 3G 3 S	--	8.4	1830	93	46	214	2	12	232	73	425	9.5	0.4	0.43	53	1040	421	
4-30-51				4.64	3.78	9.30	0.05	0.40	3.80	1.52	11.99	0.15						
				26	21	52		2	21	9	67	1						1042
165/ 1W- 3G 4 S	--	8.2	2232	--	--	--	--	0	268	--	595	31	--	--	--			560
4-30-51									4.39		16.78	0.50						
165/ 1W- 3G 5 S	--	7.5	2688	157	87	267	--	0	220	85	720	64.5	--	0.11	--			750
4-30-51				7.83	7.15	11.61			3.61	1.77	20.30	1.04						
				29	27	44			14	7	76	4						2126
																		1489
165/ 1W- 3G 6 S	--	7.5	2114	--	--	--	--	0	241	--	605	54	--	--	--			608
4-30-51									3.95		17.06	0.87						
165/ 1W- 3G 7 S	--	--	2597	--	--	--	--	0	212	--	665	65	--	--	--			
4-30-51									3.47		18.75	1.05						
165/ 1W- 3H 1 S	--	7.5	2146	128	62	205	--	0	244	70	520	50	--	0.10	--			1562
4-24-51				6.39	5.10	8.91			4.00	1.46	14.66	0.81						575
				31	25	44			19	7	70	4						1155
165/ 1W- 3H 2 S	--	--	2237	--	--	--	--	0	237	--	560	57	--	--	--			
4-23-51									3.88		15.79	0.92						
165/ 1W- 3H 4 S	--	7.2	2597	154	77	254	--	0	307	91	610	53	--	0.13	--			701
4-24-51				7.68	6.33	11.04			5.03	1.89	17.20	0.85						
				31	25	44			20	8	69	3						1691
																		1390
165/ 1W- 3H 6 S	--	--	1961	--	--	--	--	0	171	--	480	44	--	--	--			
4-24-51									2.80		13.54	0.71						
165/ 1W- 3J 1 S	--	7.2	2300	138	80	242	1	0	253	82	610	8.9	0.2	0.30	31	2180	674	
10-22-57				6.89	6.58	10.52	0.03		4.15	1.71	17.20	0.14						
				29	27	44			18	7	74	1						1318
165/ 1W- 3K 1 S	--	7.2	2185	122	58	229	--	0	271	123	505	49	--	0.08	--			543
4-24-51				6.09	4.77	9.96			4.44	2.56	14.24	0.79						
				29	23	48			20	12	65	4						1375
																		1219
165/ 1W- 3K 3 S	--	8.1	4730	320	173	455	3	0	341	178	1370	156	0.2	0.10	52			1511
4-19-55				15.97	14.23	19.78	0.08		5.59	3.71	38.53	2.52						
				32	28	40			11	7	77	5						3131
																		2875
165/ 1W- 3K 4 S	--	7.0	4651	305	151	384	--	0	342	120	1220	142	--	0	--			1383
1-12-51				15.22	12.42	16.70			5.61	2.50	34.40	2.29						
				34	28	38			13	6	77	5						2940
																		2490
165/ 1W- 3K 5 S	--	7.5	4850	310	133	520	2	0	417	177	1320	73.2	0.1	0.30	--			1322
2- 7-53				15.47	10.94	22.61	0.05		6.83	3.69	37.22	1.18						
				32	22	46			14	8	76	2						3538
																		2741
165/ 1W- 3M 1 S	66	8.0	1280	62	24	158	4	0	164	50	293	6.2	--	0	--			253
2- 5-53				3.09	1.97	6.87	0.10		2.69	1.04	8.26	0.10						
				26	16	57	1		22	9	68	1						741
																		678
165/ 1W- 3N 1 S	78	8.1	1072	78	44	126	6	0	174	56	323	22	0.2	0.11	35	861	376	
11-16-58				3.89	3.62	5.48	0.15		2.85	1.17	9.11	0.35						
				30	28	42	1		21	9	66	3						776
165/ 1W- 3O 1 S	73	7.3	2580	156	83	238	10	0	342	92	555	103.0	0.1	0.18	--			731
8- 2-56				7.78	6.83	10.35	0.26		5.61	1.92	15.65	1.66						
				31	27	41	1		23	8	63	7						1670
																		1405
165/ 1W- 3O 3 S	--	7.3	3676	234	123	354	--	0	332	110	955	138	--	0.09	--			1091
0- 0-51				11.68	10.12	15.39			5.44	2.29	26.93	2.23						
				31	27	41			15	6	73	6						2859
																		2077

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed
Date sampled																

LOWER SAN DIEGO HYDRO SUBUNIT				207AU		SAN DIEGO HYDRO UNIT										20700					
165/ 1W- 3R 1 5 5- 7-51	--	6.7	1821	99 4.94 27	51 4.19 23	207 9.00 50	--	0	337 5.52 29	38 0.79 4	435 12.27 65	11.4 0.18 1	--	0.08	--		457 1255 1007				
165/ 1W-10A 1 5 5- 7-51	--	7.5	2218	131 6.54 32	70 5.76 28	186 8.09 40	--	0	256 4.20 20	89 1.85 9	505 14.24 67	63 1.02 5	--	0	--		615 1454 1170				
165/ 1W-10A 2 5 4-18-56	60	7.9	1111	100 4.99 39	34 2.80 22	115 5.00 39	5 0.13 1	0	171 2.80 21	343 7.14 55	108 3.03 23	4.5 0.07 1	0.6	0.22	1.0		390 875 804				
165/ 1W-10A 3 5 5- 7-51	--	--	2137	--	--	--	--	0	198 3.25	--	570 16.07	47 0.76	--	--	--						
165/ 1W-108 1 5 1-12-51	--	7.6	3546	177 8.83 24	74 6.09 16	507 22.04 60	--	0	342 5.61 15	116 2.42 6	1060 29.89 78	31 0.50 1	--	0.14	--		747 2294 2133				
165/ 1W-10D 1 5 4-12-60	74	7.9	1372	62 3.09 24	29 2.38 19	166 7.22 56	5 0.13 1	--	168 2.75 22	42 0.87 7	312 8.60 70	9.7 0.16 1	0.5	0.19	21		816 730 274				
165/ 1W-10E 1 5 5- 2-51	--	8.1	1490	60 2.99 22	22 1.81 13	205 8.91 65	2 0.05	0	156 2.56 18	66 1.37 10	354 9.98 72	0	0.5	0.35	29		815 816 240				
165/ 1W-10E 2 5 12-15-59	--	7.5	1256	68 3.39 30	25 2.06 18	133 5.78 51	5 0.13 1	0	167 2.74 25	92 1.92 17	220 6.43 58	2 0.03	0.4	0.16	25		600 661 273				
165/ 1W-10F 1 5 1- 4-50	--	--	--	47 2.35 20	14 1.15 10	188 8.17 70	--	0	205 3.36 29	59 1.23 11	252 7.11 61	0	--	--	31		720 692 175				
165/ 1W-10G 1 5 5- 7-51	--	7.6	4901	293 14.62 30	130 10.69 22	552 24.00 49	--	0	376 6.16 13	85 1.77 4	1375 38.78 80	92 1.46 3	--	0.16	--		1267 3706 2712				
165/ 1W-10G 2 5 1-12-51	--	7.0	8850	484 24.15 25	199 16.37 17	1306 56.78 58	--	0	356 5.83 6	307 6.39 6	3120 87.98 67	58 0.94 1	--	0.16	--		2028 6005 5649				
165/ 1W-11A 2 5 9-20-51	--	7.9	1608	84 4.19 26	53 4.36 27	173 7.52 47	--	0	256 4.20 26	67 1.39 9	345 9.73 61	44 0.71 4	--	0.03	--		428 1075 892				
165/ 1W-11B 4 5 9- 0-51	--	--	893	--	--	--	--	--	--	--	168 4.74	0.5 0.01	--	--	--						
165/ 1W-11B 5 5 9-20-51	--	8.0	1754	92 4.59 26	52 4.28 24	199 8.65 49	--	0	290 4.75 27	86 1.79 10	375 10.58 60	30 0.48 3	--	0.13	--		444 1216 977				
165/ 1W-11F 1 5 7-13-51	--	8.4	1920	95 4.74 26	65 5.35 29	190 8.26 45	1 0.03	0	187 3.06 17	66 1.37 8	438 12.55 69	71 1.15 6	0.2	0.10	64		1080 1082				
165/ 1W-11G 1 5 8- 1-51	--	7.5	2230	160 7.98 38	81 6.66 32	141 6.13 30	--	0	251 4.11 19	61 1.27 6	535 15.09 69	89 1.44 7	--	0	--		733 1672 1190				
165/ 1W-11J 1 5 5-17-51	--	7.3	3058	180 6.98 30	97 7.98 26	306 13.30 44	--	0	237 3.88 13	107 2.23 7	810 22.84 74	115 1.85 6	--	0.16	--		849 2265 1732				
165/ 1W-11J 2 5 5-16-51	--	7.2	2132	--	--	--	--	0	283 4.64	--	525 14.81	59 0.95	--	--	--		632				
165/ 1W-11J 4 5 5-16-51	--	7.9	1709	--	--	--	--	0	181 2.97	--	435 12.27	44 0.71	--	--	--		500				
165/ 1W-11J 5 5 5-16-51	--	7.9	2451	150 7.49 31	98 8.08 33	204 8.87 36	--	0	242 3.97 16	89 1.85 6	611 17.23 71	80 1.29 5	--	0.10	--		778 1924 1351				
165/ 1W-11J 7 5 5-16-51	--	--	2026	--	--	--	--	0	246 4.03	--	500 14.10	61 0.98	--	--	--						
165/ 1W-11P 1 5 5-14-51	--	8.2	1825	--	--	--	--	--	342 5.61	--	390 11.00	70 1.13	--	--	--		448				
165/ 1W-11P 3 5 5-14-51	--	7.4	3106	185 9.23 30	98 8.06 26	310 13.48 44	--	0	239 3.92 12	115 2.39 7	830 23.41 73	140 2.26 7	--	0.10	--		865 2645 1796				

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date sampled																	

LOWER SAN DIEGO HYDRO SUBUNIT				207A0				SAN DIEGO HYDRO UNIT				20700							
16S/ 1W-11P 4 S 11- 6-63	--	7.3	3000	212 10.58 32	75 6.17 19	365 15.87 49	2 0.05	0	261 4.28 13	151 3.14 10	819 23.10 71	111 1.79 6	0.4	0.20	42	2242	838		
																1906			
16S/ 1W-11R 1 S 5-17-51	--	--	1639	--	--	--	--	0	205 3.36	--	365 10.29	73 1.18	--	--	--				
16S/ 1W-11R 2 S 5-16-51	--	7.9	1520	68 3.39 22	53 4.36 29	166 7.22 48	5 0.13 1	0	271 4.44 30	91 1.89 13	276 7.78 52	48 0.77 5	0.3	0.15	53	894	388		
																894			
16S/ 1W-11R 3 S 5-17-51	--	--	3003	--	--	--	--	0	244 4.00	--	785 22.14	108 1.74	--	--	--				
16S/ 1W-12A 1 S 5-16-51	--	7.0	2910	191 9.53 31	111 9.13 30	273 11.87 39	--	0	354 5.80 18	190 3.96 12	725 20.45 63	147 2.37 7	--	0	--	1972	934		
																1811			
16S/ 1W-12A 2 S 5-16-51	--	7.6	1848	--	--	--	--	0	317 5.20	--	362 10.21	86 1.39	--	--	--		512		
16S/ 1W-12B 1 S 9-20-51	--	7.6	1344	68 3.39 26	40 3.29 25	145 6.30 49	--	0	237 3.88 29	44 0.92 7	275 7.76 59	39.7 0.64 5	--	0.07	--	889	334		
																728			
16S/ 1W-12F 1 S 6- 6-51	--	8.0	1866	--	--	--	--	0	238 3.90	--	436 12.30	37 0.60	--	--	--		516		
16S/ 1W-12G 2 S 5-16-51	--	7.1	1949	110 5.49 29	78 6.41 34	160 6.96 37	--	0	224 3.67 19	76 1.58 8	460 12.97 68	49 0.79 4	--	0.09	--	1574	595		
																1043			
16S/ 1W-12G 3 S 6- 6-51	--	7.9	2188	--	--	--	--	0	344 5.64	--	495 13.96	52 0.84	--	--	--		672		
16S/ 1W-12G 4 S 5-16-51	--	--	1848	--	--	--	--	0	273 4.47	--	420 11.84	52 0.84	--	--	--				
16S/ 1W-12G 5 S 1-11-51	--	7.9	2140	108 5.39 26	81 6.66 32	200 8.70 42	3 0.08	0	258 4.23 20	94 1.96 9	462 13.03 63	96 1.58 8	--	0.07	59	1230	603		
																1232			
16S/ 1W-12G 6 S 5-14-51	--	7.3	1934	--	--	--	--	0	231 3.79	--	480 13.54	62 1.00	--	--	--		592		
16S/ 1W-12H 1 S 5-16-51	--	--	2217	--	--	--	--	0	293 4.80	--	500 14.10	91 1.47	--	--	--				
16S/ 1W-12H 3 S 5-15-51	--	--	1961	--	--	--	--	0	285 4.67	--	425 11.99	69 1.11	--	--	--				
16S/ 1W-12H 4 S 5-15-51	--	7.4	1916	106 5.29 28	71 5.84 31	177 7.70 41	--	0	317 5.20 26	72 1.50 8	425 11.99 61	59 0.95 5	--	0.08	--	1216	557		
																1066			
16S/ 1W-12H 5 S 5-16-51	--	7.1	2137	--	--	--	--	0	337 5.52	--	490 13.62	71 1.15	--	--	--		652		
16S/ 1W-12H 6 S 5-15-51	--	--	1718	--	--	--	--	0	246 4.03	--	380 10.72	44 0.71	--	--	--				
16S/ 1W-12J 1 S 5-14-51	--	--	1658	--	--	--	--	0	215 3.52	--	345 9.73	110 1.77	--	--	--				
16S/ 1W-12J 2 S 5-15-51	--	--	1045	--	--	--	--	0	220 3.61	--	160 5.08	64 1.03	--	--	--				
16S/ 1W-12J 3 S 11- 6-63	--	7.4	3050	253 12.62 37	153 12.58 37	207 9.00 26	5 0.13	0	195 3.20 9	192 4.00 12	840 23.69 70	190 3.06 9	0.2	0.23	40	2268	1261		
																1976			
16S/ 1W-12J 4 S 11-16-58	--	7.5	1805	115 5.74 31	84 6.91 38	129 5.61 31	5 0.13 1	--	185 3.03 17	75 1.56 9	426 12.01 67	88 1.42 8	0.3	0	50	1464	633		
																1063			
16S/ 1W-12J 5 S 5-15-51	--	7.2	2280	126 6.29 30	75 6.17 29	202 8.78 41	--	0	200 3.28 15	68 1.42 6	575 16.22 74	58 0.94 4	--	0	--	1585	623		
																1202			

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT									ZOTUO				
165/ 1W-12J 6 S 5-15-51	--	--	2137	--	--	--	--	0	203	--	525	61	--	--	--		
									3.33		14.81	0.98					
165/ 1W-12K 1 S 5-14-51	--	--	1513	--	--	--	--	0	193	--	370	80	--	--	--		
									3.16		9.02	1.29					
165/ 1W-12K 2 S 5-14-51	--	8.0	1205	--	--	--	--	0	238	--	214	70	--	--	--		300
									3.90		6.03	1.13					
165/ 1W-12K 3 S 5-14-51	--	7.2	1368	--	--	--	--	0	237	--	260	55	--	--	--		444
									3.88		7.33	0.89					
165/ 1W-12K 4 S 5-14-51	--	--	1424	--	--	--	--	0	212	--	300	48	--	--	--		
									3.47		8.46	0.77					
165/ 1W-12K 5 S 5-14-51	--	--	1049	--	--	--	--	0	198	--	210	41	--	--	--		
									3.25		5.92	0.66					
165/ 1W-12K 6 S 5-14-51	--	7.5	926	43	42	79	--	0	156	37	200	35.3	--	0.12	--		280
				2.15	3.45	3.43			2.56	0.77	5.64	0.57				681	
				24	38	36			27	8	59	6				513	
165/ 1W-12L 1 S 5-22-51	--	7.4	1020	54	43	82	2	0	149	37	207	43	0.5	0.12	70	612	314
				2.69	3.54	3.57	0.05		2.44	0.77	5.64	0.69					
				27	36	36	1		25	8	60	7				612	
165/ 1W-12M 1 S 5-22-51	--	8.0	2140	129	87	166	4	0	125	50	580	41	0	0.11	61	1180	680
				6.44	7.15	7.22	0.10		2.05	1.04	16.36	0.66					
				31	34	35			10	5	61	3				1180	
165/ 1W-12M 2 S 5-23-51	--	7.3	2063	118	86	150	--	0	274	83	480	79	--	0	--		647
				5.89	7.07	6.52			4.49	1.73	13.54	1.27				1516	
				30	36	33			21	8	64	6				1131	
165/ 1W-12N 1 S 5-17-51	--	7.1	3650	218	122	354	--	0	288	101	965	121	--	0.26	--		1046
				10.88	10.03	15.39			4.72	2.10	27.21	1.95				2743	
				30	28	42			13	6	76	5				2023	
165/ 1W-12N 2 S 6- 7-51	--	7.8	2530	123	78	285	2	0	208	79	655	32	0.2	0.17	62	1420	620
				6.14	6.41	12.39	0.05		3.41	1.64	18.47	0.52					
				25	26	50			14	7	77	2				1419	
165/ 1W-12N 3 S 5-22-51	--	8.2	1109	--	--	--	--	0	220	--	196	68	--	--	--		252
									3.61		5.53	1.10					
165/ 1W-12P 1 S 5-28-51	--	7.9	780	65	16	89	1	0	336	90	20	29	2.0	0.15	20	498	228
				3.24	1.32	3.87	0.03		5.51	1.87	0.56	0.47					
				38	16	46			66	22	7	6				497	
165/ 1W-12P 2 S 5-22-51	--	7.9	3003	176	112	272	--	0	218	140	775	126	--	0.04	--		900
				8.78	9.21	11.83			3.57	2.91	21.86	2.03				3003	
				29	31	40			12	10	72	7				1708	
165/ 1W-12P 3 S 5-22-51	--	7.7	1575	--	--	--	--	0	156	--	385	112	--	--	--		456
									2.56		10.86	1.81					
165/ 1W-12P 4 S 5-28-51	--	7.6	1242	--	--	--	--	0	244	--	226	56	--	--	--		236
									4.00		6.37	0.90					
165/ 1W-12Q 3 S 6- 7-51	--	7.6	1866	--	--	--	--	0	195	--	510	39	--	--	--		564
									3.20		14.36	0.63					
165/ 1W-12Q 4 S 6- 7-51	--	7.6	1934	--	--	--	--	0	168	--	535	43	--	--	--		572
									2.75		15.09	0.69					
165/ 1W-12Q 6 S 5-28-51	--	--	1869	--	--	--	--	0	198	--	425	117	--	--	--		
									3.25		11.99	1.89					
165/ 1W-12Q 8 S 1-12-51	--	7.4	1036	38	27	142	--	0	198	42	202	21	--	0.20	--		206
				1.90	2.22	6.17			3.25	0.87	5.70	0.34				600	
				18	22	60			32	9	56	3				570	
165/ 1W-12Q10 S 6-19-51	--	8.0	1040	51	39	102	3	0	214	57	181	63	0.2	0.60	58	640	288
				2.54	3.21	4.43	0.08		3.51	1.19	4.54	1.02					
				25	31	43	1		34	12	44	10				640	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT									Z0700				
165/ 1W-12R 1 S	--	7.1	989	--	--	--	--	0	242	--	138	66	--	--	--		292
5-17-51									3.97		3.89	1.06					
165/ 1W-12R 2 S	--	7.5	922	41	39	83	--	0	227	46	118	53	--	0	--		263
5-17-51				2.05	3.21	3.61			3.72	0.96	3.33	0.85				700	492
				23	36	41			42	11	38	10					
165/ 1W-12R 3 S	--	7.6	1790	94	86	174	8	0	170	46	425	100	0.3	0.49	50	1050	506
6-19-51				4.69	5.43	7.57	0.20		2.79	0.96	11.99	1.61					
				26	30	42	1		16	6	69	9				1047	
165/ 1W-13A 2 S	--	7.3	2538	139	95	216	--	0	134	50	740	47.2	--	0.14	--		738
9-21-51				6.94	7.81	9.39			2.20	1.04	20.87	0.76				2156	1353
				29	32	39			9	4	84	3					
165/ 1W-13M 1 S	--	--	--	58	37	106	--	0	287	97	128	16	--	--	26	625	297
2- 9-51				2.89	3.04	4.61			4.70	2.02	3.61	0.26					
				27	29	44			44	19	34	2				609	
165/ 1W-14A 1 S	--	7.5	1690	80	59	188	--	0	429	108	280	14	--	0.05	--		442
5-16-51				3.99	4.85	8.17			7.03	2.25	7.90	0.23				969	940
				23	29	48			40	13	45	1					
165/ 1W-14B 3 S	--	--	1798	--	--	--	--	0	320	--	325	143	--	--	--		
5-15-51									5.24		9.17	2.31					
165/ 1W-14C 1 S	--	7.1	15385	384	174	3174	--	0	168	84	6020	21	--	0.06	--		1675
5-15-51				19.16	14.31	138.01			2.75	1.75	169.76	0.34				11344	9940
				11	8	80			2	1	97						
165/ 1W-14C 2 S	--	--	2045	--	--	--	--	0	293	--	425	112	--	--	--		
5-15-51									4.80		11.99	1.81					
165/ 1W-14C 3 S	--	7.6	1445	63	45	165	--	0	234	41	295	73	--	0.02	--		342
5-10-51				3.14	3.70	7.17			3.84	0.85	8.32	1.18				834	797
				22	26	51			27	6	59	8					
165/ 1W-14C 5 S	--	--	1499	--	--	--	--	0	229	--	305	93	--	--	--		
5-14-51									3.75		8.60	1.50					
165/ 1W-14C 7 S	--	7.3	2619	114	85	280	--	0	351	154	550	73	--	0.04	--		635
5-14-51				5.69	6.99	12.17			5.75	3.21	15.51	1.18				1571	1429
				23	28	49			22	13	60	5					
165/ 1W-14F 1 S	--	7.5	1212	--	--	--	--	0	349	--	152	45	--	--	--		276
5-14-51									5.72		4.29	0.73					
165/ 1W-14F 2 S	--	8.4	1176	42	32	146	--	19	229	51	161	58	--	0.08	--		237
5-14-51				2.10	2.63	6.44		0.63	3.75	1.06	4.54	0.94				725	624
				19	24	58		6	34	10	42	9					
165/ 1W-14H 1 S	--	--	1645	--	--	--	--	0	390	--	260	54	--	--	--		
5-16-51									6.39		7.33	0.87					
165/ 1W-14H 3 S	--	8.1	1934	--	--	--	--	0	454	--	370	46	--	--	--		580
5-15-51									7.44		10.43	0.74					
165/ 1W-14L 1 S	--	7.3	733	34	36	89	--	0	271	41	98	26	--	0.04	--		233
5-15-51				1.70	2.96	3.87			4.44	0.85	2.76	0.42				534	457
				20	35	45			52	10	33	5					
165/ 1W-14M 1 S	--	7.2	2342	126	92	280	--	0	464	307	400	17	--	0.13	--		694
5-16-51				6.29	7.57	11.30			7.60	6.39	11.28	0.27				1639	1430
				25	30	45			30	25	44	1					
165/ 1W-14M 3 S	--	--	1093	--	--	--	--	0	266	--	180	24	--	--	--		
5-10-51									4.36		5.08	0.39					
165/ 1W-14M 5 S	--	7.7	1185	45	32	151	--	0	278	54	210	26	--	0.06	--		244
5- 9-51				2.25	2.63	6.57			4.56	1.12	5.92	0.42				702	655
				20	23	57			38	9	49	3					
165/ 1W-14NS1 S	--	7.0	2110	110	78	207	--	0	439	168	325	1.9	--	0.02	--		595
5-16-51				5.49	6.41	9.00			7.20	3.50	9.17	0.03				1317	1106
				26	31	43			36	18	46						
165/ 1W-15G 1 S	--	7.9	3474	119	79	463	--	0	324	84	920	8.7	--	0.05	--		622
5- 8-51				5.94	6.50	20.13			5.31	1.75	25.94	0.14				2096	1833
				18	20	62			16	5	78						
165/ 1W-15J 2 S	--	6.3	1027	44	27	130	--	0	278	70	121	63	--	0	--		221
5- 9-51				2.20	2.22	5.65			4.56	1.46	3.41	1.02				622	592
				22	22	56			44	14	33	10					

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date sampled																	

LOWER SAN DIEGO HYDRO SUBUNIT 207A0

SAN DIEGO HYDRO UNIT

20700

16S/ 1W-15K 2 S 4-19-62	--	7.7	6400	140 6.99 9	137 11.27 15	1310 56.96 76	7 0.16	0	968 15.87 22	978 20.36 28	1261 35.56 47	10 0.16	1.0	0.72	50	4424 4371	914
16S/ 1W-15K 3 S 8- 2-56	71	7.8	6140	174 8.68 14	115 7.46 15	989 43.00 70	2 0.05	0	525 8.60 14	252 5.25 9	1670 47.09 71	32.4 0.52 1	0.7	0.35	--	3716 3494	908
16S/ 1W-15K 4 S 5- 8-51	--	8.5	2290	86 4.29 18	68 5.54 23	325 14.13 59	1 0.03	26 0.87 4	422 6.92 30	46 0.96 4	508 14.33 62	7.4 0.12 1	0.4	0.34	35	1310 1311	494
16S/ 1W-15K 5 S 5- 8-51	--	7.9	1385	81 4.04 30	30 2.47 18	162 7.04 52	--	0	264 4.33 33	59 1.23 10	256 7.22 56	10 0.16 1	--	0.10	--	777 728	326
16S/ 1W-15K 6 S 5- 8-51	--	8.1	1258	--	--	--	--	0	303 4.97	--	243 6.85	10 0.16	--	--	--	--	326
16S/ 1W-15K 7 S 5- 9-51	--	--	1458	--	--	--	--	0	329 5.39	--	305 8.60	13 0.21	--	--	--	--	--
16S/ 1W-15K 8 S 11- 6-63	--	7.6	2600	148 7.39 23	75 6.17 20	415 18.04 57	1 0.03	0	573 9.39 30	394 8.20 26	496 13.99 44	10 0.16 1	0.4	0.45	53	1816 1875	679
16S/ 1W-15P 1 S 5- 9-51	--	7.8	770	66 3.29 38	18 1.48 17	89 3.87 45	1 0.03	0	336 5.51 66	89 1.85 22	20 0.56 7	28 0.45 5	2.0	0.19	20	499 498	239
16S/ 1W-15R 1 S 5- 9-51	--	7.3	1180	64 3.19 25	52 4.28 34	118 5.13 40	3 0.06 1	0	269 4.74 39	151 3.14 26	144 4.06 33	20 0.32 3	0.1	0.10	60	755 754	374
16S/ 1W-23E 1 S 10-11-51	--	7.5	1606	61 3.04 18	65 5.35 32	196 8.52 50	--	0	332 5.44 32	217 4.52 27	255 6.63 39	25 0.37 2	--	0.19	--	1056 960	420
16S/ 2W- 20 1 S 4- 8-59	--	7.8	2779	68 3.39 12	62 5.10 18	439 19.09 69	5 0.13	0	315 5.16 19	107 2.23 8	693 19.54 72	3 0.05	1.5	0.18	30	1826 1563	425
16S/ 2W- 3L 1 S 6- 1-60	74	7.4	2581	119 5.94 22	75 6.17 23	331 14.39 54	10 0.26 1	0	307 5.03 19	262 5.45 21	570 16.07 60	2 0.03	0.6	0.62	19	1740 1540	606
16S/ 2W- 3P 1 S 2-24-60	--	7.3	3090	196 9.78 31	88 7.24 23	336 14.61 46	2 0.05	0	439 7.20 23	235 4.89 16	679 19.15 61	16 0.26 1	0.7	0.15	38	1811 1807	852
16S/ 2W- 40 1 S 10-28-58	--	7.3	2380	160 7.98 34	51 4.19 18	250 10.87 47	4 0.10	--	423 6.93 30	210 4.37 19	412 11.62 50	11 0.18 1	0.5	--	32	609 1338	609
16S/ 2W- 50 1 S 2-17-59	--	7.3	1400	149 7.44 46	35 2.88 18	13 5.74 36	2 0.05	0	250 4.10 25	288 6.00 37	216 6.09 37	7.6 0.12 1	0.3	0.13	35	1039 988	516
16S/ 2W- 5M 1 S 5-31-60	76	7.5	1406	54 2.69 19	28 2.30 16	214 9.30 64	8 0.20 1	0	346 5.67 41	111 2.31 17	206 5.81 42	0	0.2	0.40	9	975 801	250
16S/ 2W- 5N 1 S 4- 8-59	--	7.6	1432	51 2.54 18	20 1.64 11	230 10.00 70	4 0.10 1	0	315 5.16 36	118 2.46 17	241 6.80 47	0	0.5	0.08	22	994 841	209
16S/ 2W- 9B 1 S 10-31-62	--	7.6	2350	26 1.30 7	54 4.44 23	310 13.48 70	2 0.05	0	436 7.15 26	287 5.98 22	511 14.41 52	14 0.23 1	0.2	0.26	33	1494 1452	267
16S/ 2W- 9C 4 S 7-25-61	--	8.0	2970	242 12.08 36	97 7.46 24	314 13.65 44	6 0.15	0	471 7.72 23	377 7.85 23	636 17.99 54	0	--	0.33	16	2524 1924	1004
16S/ 2W- 9C 5 S 2-24-60	69	7.5	1610	120 5.99 29	57 4.64 23	228 9.91 46	5 0.13 1	0	276 4.56 22	220 4.58 22	399 11.25 55	3.7 0.06	0.8	0.18	23	1192 1193	534
16S/ 2W- 9C 6 S 8-11-58	--	7.3	1700	96 4.79 33	39 3.21 27	151 6.57 45	--	0	254 4.16 29	70 1.46 10	316 8.91 61	0	0.4	0.20	24	400 821	400
16S/ 2W- 9C 7 S 8-11-58	--	7.5	1625	78 3.89	38 3.13	157 6.83	--	0	374 6.13	70 1.46	220 6.20	--	0.7	0.10	24	351	351
16S/ 2W- 9F 1 S 6- 1-60	71	7.1	2800	162 8.08 29	59 4.85 17	347 15.09 54	7 0.18 1	0	581 9.52 33	171 3.56 12	554 15.62 54	7 0.11	0.3	0.60	19	1920 1613	847

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT										20700									
207A0																							
16S/ 2W- 9L 1 S	--	7.2	3150	240	91	320	1	0	366	296	743	0.9	0.2	0	36		974						
5-22-57				11.98	7.48	13.91	0.03		6.00	6.16	20.95	0.01				2208							
				36	22	42			18	19	63					1908							
16S/ 2W- 9N 1 S	--	8.1	957	70	25	90	4	0	105	273	80	1	0.5	0	10	668	278						
4- 9-59				3.49	2.06	3.91	0.10		1.72	5.66	2.26	0.02				605							
				37	22	41	1		18	59	23												
16S/ 2W-16C 1 S	80	7.5	3906	359	122	280	5	0	188	112	1200	36	0.4	0.03	40		1398						
7-27-54				17.91	10.03	12.17	0.13		3.08	2.33	33.84	0.58				2657							
				45	25	30			8	6	65	1				2247							
16S/ 2W-160 3 S	78	7.2	1761	125	34	178	2	0	317	144	317	0	0.1	0.06	21	1175	452						
6- 1-60				6.24	2.80	7.74	0.05		5.20	3.00	8.94					977							
				37	17	46			30	18	52												
16S/ 2W-16E 5 S	71	7.7	1740	204	29	176	4	0	375	132	404	1.5	0.2	0.06	35	1324	629						
2-18-59				10.18	2.38	7.65	0.10		6.15	2.75	11.39	0.02				1170							
				50	12	38			30	14	56												
16S/ 2W-16G 1 S	--	6.7	2060	124	72	210	--	0	220	130	530	0.0	0.1	0.30	20		606						
6-28-51				6.19	5.92	9.13			3.61	2.71	14.95					1195							
				29	28	43			17	13	70												
16S/ 2W-16M 2 S	74	7.8	962	62	26	88	4	0	89	265	88	1	0.3	0.04	6	650	262						
6- 1-60				3.09	2.14	3.83	0.10		1.46	5.52	2.48	0.02				584							
				34	23	42	1		15	58	26												
16S/ 2W-17D 1 S	74	7.2	3160	226	68	363	5	0	432	383	615	9	0.3	0.60	11	2155	844						
5-31-60				11.28	5.59	15.78	0.13		7.08	7.97	17.34	0.15				1893							
				34	17	48			22	24	53												
16S/ 2W-170 2 S	--	7.1	--	189	93	--	--	--	--	360	593	2.0	0.8	--	--	1776	855						
2- 6-63				9.43	7.65					7.50	16.72	0.03											
16S/ 2W-17H 1 S	--	7.9	2800	210	66	330	3	0	373	200	702	6.5	0.1	0.29	23	1976	796						
10-31-63				10.48	5.43	14.35	0.08		6.11	4.16	19.80	0.10				1724							
				35	18	47			20	14	66												
16S/ 2W-17H 2 S	--	7.3	1060	51	23	103	12	--	140	142	139	0.0	0.4	--	18	560	222						
7-17-57				2.54	1.89	4.46	0.31		2.29	2.96	3.92					557							
				28	20	49	3		25	32	43												
16S/ 2W-17L 1 S	76	8.0	1380	46	27	240	4	0	336	120	247	0	0.8	0.46	19	854	226						
10-31-63				2.30	2.22	10.44	0.10		5.51	2.50	6.97					869							
				15	15	69	1		37	17	47												
16S/ 2W-18M 1 S	--	7.5	1560	48	17	255	4	--	311	91	282	0.0	1.2	--	20	860	190						
5-12-58				2.40	1.40	11.09	0.10		5.10	1.89	7.95					871							
				16	9	74	1		34	13	53												
16S/ 2W-18N 1 S	--	7.8	2931	122	115	340	5	0	416	154	703	4	0.7	0.44	50	1944	778						
4- 9-59				6.09	9.46	14.78	0.13		6.82	3.21	19.82	0.06				1699							
				20	31	49			23	11	66												
16S/ 2W-180 3 S	68	7.2	1786	103	46	215	4	0	303	146	368	2.5	0.6	0.14	--		446						
4-22-55				5.14	3.78	9.35	0.10		4.97	3.04	10.38	0.04				1105							
				28	21	51	1		27	16	56					1034							
16S/ 3W-13Q 1 S	--	7.3	2440	125	71	370	3	0	369	262	579	0	0.2	0.28	21	1702	604						
10-31-63				6.24	5.84	16.09	0.08		6.05	5.45	16.33					1613							
				22	21	57			22	20	59												
16S/ 3W-13R 1 S	71	7.7	1484	105	41	170	3	--	242	192	290	4.0	0.4	0.12	25	965	431						
9-11-58				5.24	3.37	7.39	0.08		3.97	4.00	8.18	0.06				949							
				33	21	46			24	25	50												
16S/ 3W-21J 1 S	--	7.6	3580	178	100	500	14	0	408	324	911	1.7	0.2	0.36	20	2432	856						
10-31-63				8.88	8.22	21.74	0.36		6.69	6.75	25.69	0.03				2250							
				23	21	55	1		17	17	66												
16S/ 3W-21R 1 S	71	7.0	1934	148	76	168	8	--	334	128	450	5.5	0.4	0.10	30	1375	683						
9-10-58				7.39	6.25	7.30	0.20		5.47	2.66	12.69	0.09				1178							
				35	30	35	1		26	13	61												
16S/ 3W-21R 4 S	70	7.3	5818	290	170	653	16	0	434	411	1526	0	0.2	0.08	19	3650	1424						
5-31-60				14.47	13.98	28.39	0.41		7.11	8.56	43.03					3299							
				25	24	50	1		12	15	73												
16S/ 3W-22G 1 S	--	7.3	3750	248	100	560	4	0	443	567	706	32	0.4	0.43	20	2710	1031						
10-31-63				12.38	8.22	24.35	0.10		7.26	11.80	19.91	0.52				2456							
				27	18	54			18	30	50	1											
16S/ 3W-22H 3 S	70	7.6	4357	39	36	858	13	--	229	228	1190	5	0.8	1.30	10	2448	246						
4- 9-59				1.95	2.96	37.31	0.33		3.75	4.75	33.56	0.08				2494							
				5	7	88	1		9	11	80												
16S/ 3W-22H 4 S	--	7.3	3663	211	126	442	6	--	390	448	825	43	0.5	0.45	25	2463	1045						
4- 9-59				10.53	10.36	19.22	0.15		6.39	9.33	23.27	0.69				2319							
				26	26	48			16	24	59	2											

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap. 180°C Computed	Total hardness as CaCO ₃	
Date sampled																		

LOWER SAN DIEGO HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT										Z0700					
Z07A0																			
16S/ 3W-22J 1 S	68	7.7	3320	204	113	361	8	0	397	391	691	2.5	0.7	0.06	30	2051	974		
2-23-60				10.18	9.29	15.70	0.20		6.51	8.14	19.49	0.04							
				29	26	44	1		19	24	57					1996			
16S/ 3W-22K 2 S	68	7.2	3237	203	98	371	9	0	383	388	717	1	0.1	0.08	23	2241	910		
4- 9-59				10.13	8.06	16.13	0.23		6.28	8.08	20.22	0.02							
				29	23	47	1		18	23	56					1998			
16S/ 3W-22P 1 S	79	7.3	1087	76	24	98	4	0	221	92	164	0	0.2	0	13	690	268		
5-31-60				3.79	1.97	4.26	0.10		3.62	1.92	4.62								
				37	19	42	1		36	19	45					580			
16S/ 3W-23A 1 S	68	7.3	4930	330	160	563	2	0	436	583	1167	16	0.8	0.12	28	3213	1403		
2-23-60				16.47	13.16	24.48	0.05		7.15	12.14	32.91	0.26							
				30	24	45			14	23	63					3064			
16S/ 3W-23A 2 S	76	6.9	1674	103	46	173	7	0	151	292	282	0	0.3	0.22	5	1115	446		
5-31-60				5.14	3.78	7.52	0.18		2.47	6.08	7.95								
				31	23	45	1		15	37	48					983			
16S/ 3W-23E 5 S	68	7.0	1320	87	36	131	3	0	268	123	209	3.0	0.4	0.02	30	787	365		
2-23-60				4.34	2.96	5.70	0.08		4.39	2.56	5.89	0.05							
				33	23	44	1		34	20	46					754			
16S/ 3W-23K 1 S	73	7.7	2114	64	23	339	9	0	278	158	456	0	0.7	0.70	23	1400	254		
2-25-60				3.19	1.89	14.74	0.23		4.56	3.29	12.86								
				16	9	74	1		22	16	62					1210			
16S/ 3W-23K 2 S	--	7.9	3370	205	97	460	3	0	480	372	801	0	0.1	0.43	22		911		
7-25-61				10.23	7.98	20.00	0.08		7.87	7.75	22.59								
				27	21	52			21	20	59					2472			
																2197			
16S/ 3W-23M 1 S	72	7.6	3817	271	120	440	6	0	495	427	910	2.5	0.6	0.22	25		1170		
7-22-54				13.52	9.87	19.13	0.15		8.11	8.89	25.66	0.04				2638			
				32	23	45			19	21	60					2446			
16S/ 3W-23N 1 S	68	7.4	2800	198	67	320	5	0	481	279	502	17	0.3	0.20	26	1775	770		
9-11-58				9.88	5.51	13.91	0.13		7.88	5.81	14.16	0.27							
				34	19	47			28	21	50	1				1651			
16S/ 3W-24F 1 S	--	6.6	2605	155	66	304	7	0	127	437	525	0	0.1	0.10	10	1725	657		
5-31-60				7.73	5.43	13.22	0.18		2.08	9.10	14.81								
				29	20	50	1		8	35	57					1567			
SAN VICENTE HYDRO SUBUNIT				Z0780															
13S/ 2E-30E 1 S	76	8.2	588	43	20	49	3	0	171	22	84	14	0.1	0	25	409	190		
9-21-59				2.15	1.64	2.13	0.08		2.80	0.46	2.37	0.23							
				36	27	36	1		48	8	40	4				344			
14S/ 1E-23F 1 S	73	7.3	783	52	29	58	3	0	178	29	120	43	0.1	0	36	530	249		
9-22-59				2.59	2.38	2.52	0.08		2.92	0.60	3.36	0.69							
				34	31	33	1		38	8	45	9				458			
14S/ 1E-23P 1 S	--	7.1	943	40	20	119	1	0	237	41	145	14.9	0.6	0	--		182		
7-29-53				2.00	1.64	5.17	0.03		3.88	0.85	4.09	0.24				497			
				23	19	58			43	9	45	3				498			
14S/ 2E-4D 1 S	66	7.1	696	41	28	53	3	0	142	35	83	75	0.1	0.10	45	473	218		
9-21-59				2.05	2.30	2.30	0.08		2.33	0.73	2.34	1.21							
				30	34	34	1		35	11	35	18				433			
EL CAPITAN HYDROLOGIC SUBUNIT				Z0700															
15S/ 2E-27L 1 S	70	7.0	1366	118	53	100	7	0	425	81	221	13.6	0.3	0.16	59	920	513		
3-18-64				5.89	4.36	4.35	0.18		6.97	1.69	6.23	0.22							
				40	29	29	1		46	11	41	1				862			
15S/ 2E-28L 1 S	64	7.7	1253	82	47	74	2	0	253	47	203	30.4	0.2	0	48	795	398		
5-14-58				4.09	3.87	3.22	0.05		4.15	0.98	5.72	0.49							
				36	34	29			37	9	50	4				658			
CUYAMACA HYDRO SUBUNIT				Z0700															
12S/ 3E-35C 1 S	68	7.5	360	30	12	28	3	0	117	41	27	4.5	0.3	0	27	205	125		
5-26-64				1.50	0.99	1.22	0.08		1.92	0.85	0.76	0.07							
				40	26	32	2		53	24	21	2				230			
12S/ 3E-35P 1 S	62	7.5	525	42	21	31	4	0	144	31	46	56	0.3	0	25	290	192		
5-26-64				2.10	1.73	1.35	0.10		2.36	0.65	1.30	0.90							
				40	33	26	2		45	12	25	17				327			
12S/ 3E-35P 2 S	65	6.4	366	17	16	31	2	0	85	25	57	0.5	0.5	0	45	240	109		
5-26-64				0.85	1.32	1.35	0.05		1.39	0.52	1.61	0.01							
				24	37	38	1		39	15	46					236			
13S/ 3E-13J 1 S	60	7.2	810	62	68	21	1	0	288	144	53	7.2	0.3	0	50	570	434		
5-26-64				3.09	5.59	0.91	0.03		4.72	3.00	1.49	0.12							
				32	58	9			51	32	16	1				548			

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃

CUYAMACA HYDRO SUBUNIT				SAN DIEGO HYDRO UNIT													
				20700	20700												
135/ 4E-21K 1 S	58	6.8	417	29	20	28	5	0	159	38	31	0.0	0.3	0	35	220	155
5-26-64				1.45	1.64	1.22	0.13		2.61	0.79	0.87						
				33	37	27	3		61	19	20					264	
145/ 4E- 4M 1 S	68	7.8	267	22	10	15	1	0	83	22	17	18	0.2	0.01	60	195	96
5-26-64				1.10	0.82	0.65	0.03		1.36	0.46	0.48	0.29					
				42	32	25	1		53	18	19	11				206	
145/ 4E- 90S1 S	51	7.1	240	20	16	6	0	0	128	3	21	0	0.1	0.06	29	154	116
5-14-58				1.00	1.32	0.35			2.10	0.06	0.59						
				37	49	13			76	2	21					160	
145/ 4E- 9E 1 S	58	7.1	315	30	9	14	4	0	146	0	23	0	0.2	0	42	208	112
6-12-57				1.50	0.74	0.61	0.10		2.39		0.65						
				51	25	21	3		79		21					194	
SAN DIEGO MESA HYDRO SUBUNIT				CORONAADO HYDRO UNIT													
				20880	20800												
175/ 2W- 4B 1 S	78	7.4	957	86	19	102	4	0	383	28	123	1.5	0.4	0.12	40		293
7-22-54				4.29	1.56	4.43	0.10		6.28	0.58	3.47	0.02					
				41	15	43	1		61	6	34					590	
175/ 2W- 8J 1 S	--	7.5	764	61	12	77	3	0	251	10	100	0	0.1	0.14	19	524	202
8-14-59				3.04	0.99	3.35	0.08		4.11	0.21	2.82						
				41	13	45	1		58	3	39					406	
PARADISE HYDRO SUBUNIT				208C0													
175/ 2W-150 1 S	--	--	--	--	--	--	--	--	--	--	357	--	--	--	--		
10-31-51											10.07						
175/ 2W-15J 1 S	79	7.4	1170	40	17	210	4	0	449	52	139	19.4	0.8	0.30	25		170
7-21-54				2.00	1.40	9.13	0.10		7.36	1.08	3.92	0.31				730	
				16	11	72	1		58	9	31	2				728	
175/ 2W-160 1 S	--	8.2	--	42	23	161	3	--	220	71	185	0.0	0.3	--	--	653	200
8-15-60				2.10	1.89	7.00	0.08		3.61	1.48	5.22						
				19	17	63	1		35	14	51					593	
175/ 2W-160 2 S	--	8.1	--	36	19	138	3	--	192	62	159	0.0	0.3	--	--	575	168
8-15-60				1.80	1.56	6.00	0.08		3.15	1.29	4.48						
				19	17	64	1		35	14	50					512	
LOWER SWEETWATER HYDRO SUBUNIT				SWEETWATER HYDRO UNIT													
				209A0	20900												
175/ 1W-19K 1 S	68	2.2	7685	250	106	432	16	0	0	335	1560	38.5	0.2	0	24	5216	1061
7-19-57				12.48	8.72	18.78	0.41			6.97	43.99	0.62					
				31	22	46	1			14	85	1				2762	
175/ 1W-19K 2 S	66	7.9	3650	244	109	404	4	0	296	350	979	45	0.1	0.39	30	2598	1058
5-12-58				12.18	8.96	17.57	0.10		4.85	7.29	27.61	0.73					
				31	23	45			12	18	68	2				2311	
175/ 1W-20M 1 S	69	7.3	3306	203	76	368	3	--	335	120	865	13.6	0.5	0.20	25	2302	820
5-12-58				10.13	6.25	16.00	0.08		5.49	2.50	24.39	0.22					
				31	19	49			17	8	75	1				1839	
175/ 1W-20M 1 S	68	7.9	4545	245	108	587	4	0	319	427	1170	0	0.9	0.49	36	3021	1056
7-15-59				12.23	8.88	25.52	0.10		5.23	8.89	32.99						
				26	19	55			11	19	70					2735	
175/ 1W-30E 1 S	--	8.1	2049	102	66	220	3	0	256	167	415	46.1	0.4	0.08	--		526
9-26-53				5.09	5.43	9.57	0.08		4.20	3.48	11.70	0.74					
				25	27	47			21	17	58	4				1314	
175/ 1W-30E 2 S	--	7.6	3320	218	86	329	4	0	275	278	821	16	0.2	0.16	24	2370	898
7-15-59				10.88	7.07	14.30	0.10		4.51	5.79	23.15	0.26					
				34	22	44			13	17	69	1				1912	
175/ 2W-25P 4 S	72	7.4	2737	172	68	307	4	0	385	254	577	0	0.3	0.19	16	1863	709
7-22-58				8.58	5.59	13.35	0.10		6.31	5.29	16.27						
				31	20	48			23	19	58					1588	
175/ 2W-27E 1 S	--	8.1	1318	74	39	151	7	0	140	340	149	5.4	0.2	0	8	908	345
7-19-57				3.69	3.21	6.57	0.18		2.29	7.08	4.20	0.09					
				27	24	48	1		17	52	31	1				842	
175/ 2W-27R 1 S	70	7.6	3900	239	127	429	2	0	379	288	996	0	0.3	0.33	23		1119
4-13-62				11.93	10.44	18.65	0.05		6.21	6.00	28.09						
				29	25	45			15	15	70					2404	
175/ 2W-28R 1 S	72	7.9	3980	118	120	538	8	0	448	233	954	5.2	0.7	0.27	26	2250	789
8-19-60				5.89	9.87	23.39	0.20		7.34	4.85	26.90	0.08					
				15	25	59	1		19	12	69					2223	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Pwp 180°C Computed	Total hardness as CaCO ₃
Date sampled																	

SWEETWATER HYDRO UNIT 20900

LOWER SWEETWATER HYDRO SUBUNIT 209A0

17S/ 2W-33B 1 S	--	8.0	2810	110	49	465	15	0	329	139	791	0	0.2	0.40	22	1820	476
11- 5-63				5.49	4.03	21.09	0.36		5.39	2.89	22.31						
				18	13	68	1		16	9	73					1773	
17S/ 2W-360 1 S	--	7.9	3450	279	63	475	2	0	477	327	740	0	0.2	0.30	17	2660	1036
11- 5-63				13.92	6.63	20.65	0.05		7.62	6.81	26.51						
				34	16	50			19	17	64					2358	

MIDDLE SWEETWATER HYDRO SUBUNIT 209B0

15S/ 2E-30P 1 S	70	7.0	820	43	32	84	2	0	235	25	129	14	0.5	0.03	60	460	231
2-25-60				2.15	2.63	3.65	0.05		3.85	0.52	3.64	0.23					
				25	31	43	1		47	6	44	3				513	
15S/ 2E-310 1 S	--	6.8	--	53	27	84	3	0	102	165	100	0.4	0.3	--	--		243
8- 4-54				2.64	2.22	3.65	0.08		1.67	3.44	2.82	0.01				555	
				31	26	42	1		21	43	36					483	
15S/ 2E-310 2 S	--	7.4	--	69	25	94	4	0	194	77	146	2.0	0.6	--	--		275
4- 6-54				3.44	2.06	4.09	0.10		3.18	1.60	4.12	0.03				655	
				36	21	42	1		36	18	46					513	
15S/ 2E-310 3 S	--	8.5	--	31	25	75	4	14	140	41	96	0.9	0.6	--	--		181
5- 6-59				1.55	2.06	3.26	0.10	0.47	2.29	0.85	2.76	0.01				495	
				22	30	47	1	7	36	13	43					358	
15S/ 2E-34N 1 S	78	7.4	824	63	27	56	4	0	201	16	149	4	0.1	0.40	42	568	268
6-17-58				3.14	2.22	2.43	0.10		3.29	0.33	4.20	0.06					
				40	28	31	1		42	4	53	1				460	
16S/ 1E-11J 1 S	71	7.2	931	51	25	98	2	0	183	71	150	6.7	0.9	0.40	27	589	230
6-19-58				2.54	2.06	4.26	0.05		3.00	1.48	4.23	0.14					
				29	23	48	1		34	17	46	2				524	
16S/ 1E-120 2 S	73	7.2	873	36	23	108	3	0	209	24	157	2.0	0.5	0.30	29	567	165
6-25-58				1.80	1.69	4.70	0.08		3.43	0.50	4.43	0.03					
				21	22	55	1		41	6	53					486	
16S/ 1E-14G 1 S	72	7.1	1066	76	29	93	3	--	244	39	180	25.5	0.5	0	50	667	309
5-12-58				3.79	2.38	4.04	0.08		4.00	0.81	5.08	0.41					
				37	23	39	1		39	8	49	4				616	
16S/ 1E-16L 1 S	67	7.9	558	41	16	48	1	0	168	45	60	0	0.2	0.50	33	386	169
6-25-58				2.05	1.32	2.09	0.03		2.75	0.44	1.69						
				37	24	38	1		51	17	31					327	
16S/ 1E-19K 1 S	72	7.4	984	55	33	94	3	0	293	33	152	4.3	0.2	0.75	40	648	273
6-19-58				2.74	2.71	4.09	0.06		4.80	0.69	4.29	0.07					
				28	26	43	1		49	7	44	1				559	
16S/ 1E-29F 1 S	68	7.4	882	59	24	88	2	0	195	99	124	0	0.2	0.50	36	591	246
6-19-58				2.94	1.97	3.83	0.05		3.20	2.06	3.50						
				33	22	44	1		37	24	40					531	
16S/ 1E-318 1 S	68	7.2	1275	102	56	99	3	0	244	253	160	2.4	0.2	0.39	16	814	485
9-12-58				5.09	4.61	4.30	0.06		4.00	5.27	4.51	0.04					
				36	33	31	1		29	38	33					812	
16S/ 1E-31C 1 S	--	7.6	1231	99	46	120	2	0	344	166	167	1.0	0.4	0.06	--		436
8-27-54				4.94	3.78	5.22	0.05		5.64	3.46	4.71	0.02					
				35	27	37			41	25	34					845	
																771	
16S/ 2E- 6N 2 S	72	7.2	806	41	22	83	3	0	189	26	131	6.7	0.4	0.40	39	512	193
6-25-58				2.05	1.81	3.61	0.08		3.10	0.54	3.69	0.14					
				27	24	48	1		41	7	49	2				447	
16S/ 2E-28H 1 S	--	7.7	660	56	15	65	3	0	217	51	64	0.9	0.4	0.16	47	408	201
4-30-64				2.79	1.23	2.83	0.08		3.56	1.06	2.37	0.01					
				40	18	41	1		51	15	34					429	
16S/ 2E-320 1 S	--	6.9	633	33	14	78	2	0	176	28	104	1.2	0.4	0.05	46	379	140
4-30-64				1.65	1.15	3.39	0.05		2.60	0.58	2.43	0.02					
				26	18	54	1		45	9	46					393	
17S/ 1E- 3F 1 S	--	7.4	904	50	29	84	1	0	220	35	145	10	0.6	0.10	54	502	244
4-18-62				2.50	2.38	3.85	0.03		3.61	0.73	4.07	0.18					
				29	28	43			42	8	40	2				517	
17S/ 1E- 3N 1 S	--	7.8	740	47	30	95	2	0	214	40	137	30	0.4	0	39	552	241
3- 8-63				2.35	2.47	4.13	0.05		3.51	0.83	3.86	0.48					
				26	27	46	1		40	10	44	6				526	
17S/ 1E- 4H 1 S	--	7.5	2070	114	98	223	2	0	456	83	487	12	0.1	0.23	32	1566	688
11- 6-63				5.69	8.06	9.70	0.05		7.47	1.73	13.79	0.19					
				24	34	41			32	7	59	1				1278	
17S/ 1E- 4R 1 S	--	8.0	1098	71	44	112	2	0	320	47	175	71	0.5	0.22	--		358
8-27-54				3.54	3.62	4.87	0.05		5.24	0.98	4.74	1.15					
				29	30	40			43	8	40	9				745	
																680	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million			
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃
Date sampled																	

UPPER SWEETWATER HYDRO SUBUNIT				SWEETWATER HYDRO UNIT										Z0900					
14S/ 4E-27G 1 S 5-26-64	60	7.8	323	33 1.65 50	6 0.49 15	26 1.13 34	2 0.05 2	0	132 2.16 66	25 0.52 16	21 0.59 18	1.0 0.02 1	0.8	0.04	34	210	107		
14S/ 4E-33G 1 S 9- 4-59	--	6.6	277	37 1.85 49	11 0.50 24	23 1.00 26	1 0.03 1	0	124 2.03 54	40 0.83 22	32 0.90 24	0	0.2	0	30	260	138		
15S/ 3E-20G 1 S 5- 8-58	63	7.2	464	34 1.70 36	16 1.32 28	37 1.01 34	2 0.05 1	--	169 3.10 65	16 0.33 7	45 1.27 27	3.5 0.06 1	0.4	0	40	286	151		
15S/ 3E-26US1 S 7-23-53	--	7.4	265	16 0.00	4 0.33	33 1.43	1 0.03	0	95 1.56	--	36 1.02	0.0	0.3	0.05	--		57		
15S/ 3E-24E 1 S 4-28-64	60	6.0	351	20 1.30 36	14 1.15 32	25 1.09 30	2 0.05 1	0	122 2.00 57	13 0.27 8	36 1.02 29	12.4 0.20 6	0.2	0	63	264	123		
15S/ 4E- 9F 1 S 4-29-64	60	7.4	370	70 3.49 61	11 0.90 16	30 1.30 23	2 0.05 1	0	256 4.20 71	28 0.50 10	40 1.13 19	1.8 0.00 1	0.4	0	31	359	220		
15S/ 4E- 9GS1 S 4-29-64	58	7.4	396	44 2.20 53	9 0.74 18	27 1.17 28	3 0.08 2	0	194 3.18 75	10 0.33 8	26 0.73 17	0.4 0.01	0.4	0.01	43	250	147		
15S/ 4E-17N 1 S 5- 8-58	64	7.4	490	56 2.79 54	11 0.90 17	33 1.43 20	2 0.05 1	0	220 3.61 67	19 0.40 7	40 1.35 20	0	0.4	0.07	33	291	185		
15S/ 4E-190 1 S 4-28-64	54	7.1	520	45 2.25 41	16 1.32 24	42 1.83 33	3 0.00 1	0	167 2.74 50	79 1.64 30	40 1.13 20	1.1 0.02	0.3	0.04	37	330	179		
15S/ 4E-20M 1 S 1- 5-61	--	8.0	--	38 1.90 39	18 1.48 30	33 1.43 29	4 0.10 2	0	158 2.59 51	39 0.81 19	30 0.85 20	0.0	0.2	--	--	310	169		
16S/ 3E- 9P 1 S 10-16-53	--	7.6	588	29 1.45 26	17 1.40 25	63 2.74 49	1 0.03 1	--	186 3.05 55	17 0.30 0	74 2.09 37	5.8 0.09 2	0.3	0.05	--		143		
16S/ 3E- 9R 1 S 5- 8-58	55	6.3	465	21 1.05 25	14 1.15 27	40 2.00 47	2 0.05 1	--	103 1.69 40	10 0.33 8	70 1.07 47	14.0 0.23 5	0.4	0	40	294	110		
OTAY HYDRO SUBUNIT				Z1080															
18S/ 1W-19C 1 S 7- 9-63	--	7.7	4290	236 11.78 20	27 2.22 4	1035 45.00 76	15 0.38 1	0	232 3.80 6	370 7.70 13	1649 46.50 79	34 0.55 1	0.6	0.49	15	3647	701		
18S/ 1W-19D 1 S 7- 9-63	--	7.7	4250	244 12.18 20	147 12.09 20	846 36.78 60	11 0.28	0	268 4.39 7	431 8.97 15	1684 47.49 78	5.6 0.09	0.7	0.55	23	3778	1214		
18S/ 1W-19H 1 S 7- 9-63	75	7.6	3440	164 8.18 18	56 4.61 10	729 31.70 71	9 0.23 1	0	287 4.70 11	228 4.75 11	1230 34.69 78	9.3 0.15	0.5	0.42	15	2686	640		
18S/ 1W-20Q 1 S 7- 9-63	74	8.0	1620	59 2.94 18	5 0.41 2	307 13.35 79	4 0.10 1	0	146 2.39 14	83 1.73 10	449 12.66 75	3.7 0.06	0.3	0.43	16	1001	168		
18S/ 1W-21R 1 S 8-20-53	--	7.3	4440	297 14.82 36	7 0.58 1	600 26.09 63	5 0.13	0	124 2.03 5	199 4.14 10	1250 35.25 85	5.0 0.08	1.2	1.00	--		771		
18S/ 1W-29D 3 S 10- 1-53	--	7.2	2070	48 2.40 12	4 0.33 2	400 17.39 86	--	--	27 0.44 2	102 2.12 11	605 17.06 87	1.3 0.02	3.6	1.30	--		137		
18S/ 2W-15J 2 S 3- 7-63	--	7.5	1260	62 3.09 25	36 2.96 24	148 6.44 51	1 0.03	0	232 3.80 30	57 1.19 9	275 7.76 61	0.0	0.1	0.18	31	736	303		
18S/ 2W-15M 1 S 9-12-63	70	8.2	1470	108 5.39 36	38 3.13 21	146 6.35 42	3 0.08 1	0	177 2.90 20	89 1.85 13	353 9.95 67	3.1 0.05	0.2	0.14	24	1138	426		
18S/ 2W-15R 1 S 9-12-63	69	8.0	1270	59 2.94 26	30 2.47 22	132 5.74 51	2 0.05	0	211 3.46 30	44 0.92 8	248 6.99 61	1.9 0.03	0.4	0.12	35	714	271		
18S/ 2W-21A 1 S 8-22-63	--	7.7	1650	112 5.59 35	23 1.89 12	190 8.26 52	4 0.10 1	0	78 1.28 8	58 1.21 8	468 13.20 84	0	0.1	0.26	13	1146	374		
																		907	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃	
Date sampled																		
OTAY HYORO SUBUNIT				OTAY HYORD UNIT										Z1000				
21080																		
185/ 2W-21A 2 S 8-21-63	--	7.2	3800	266 13.27 34	118 9.70 25	360 15.65 40	6 0.15	0	104 1.70 4	134 2.79 7	1201 33.87 68	4.2 0.07	0.1	0.26	26	2166 2167	1149	
185/ 2W-21H 1 S 7-10-63	82	8.0	2150	148 7.39 32	64 5.26 23	230 10.00 44	4 0.10	0	146 2.39 11	99 2.06 9	644 18.16 80	2.5 0.04	0.2	0.07	13	1606 1276	633	
185/ 2W-21J 1 S 5-13-64	--	7.8	2650	182 9.08 33	64 5.26 19	295 12.83 47	3 0.08	0	122 2.00 7	94 1.96 7	837 23.60 86	0	0.1	0.27	16	1664 1551	718	
185/ 2W-21K 2 S 7-10-63	--	7.5	1855	124 6.19 31	38 3.13 16	241 10.48 53	1 0.03	0	217 3.56 18	127 2.64 13	443 12.49 63	70 1.13 6	0.5	0.08	23	1292 1174	466	
185/ 2W-21L 1 S 7-13-54	69	7.2	1942	120 5.99 30	58 4.77 24	205 8.91 45	2 0.05	0	254 4.16 21	52 1.08 6	500 14.10 73	1.5 0.02	0.5	0.18	--	1445 1064	538	
185/ 2W-21M 1 S 6-23-64	--	7.9	2551	164 8.18 34	63 5.18 22	243 10.57 44	5 0.13 1	0	154 2.52 11	111 2.31 10	672 18.95 80	1.0 0.02	0.5	0.20	--	1660 1335	669	
185/ 2W-21O 1 S 7-13-54	69	7.2	2481	130 6.49 25	74 6.09 24	300 13.04 51	1 0.03	0	281 4.61 18	122 2.54 10	625 17.63 70	30 0.48 2	0.6	0.22	--	630 1780 1421		
185/ 2W-22D 1 S 8-21-63	--	7.7	1330	97 4.84 36	30 2.47 19	135 5.87 44	4 0.10 1	0	162 2.66 20	93 1.94 15	298 8.40 65	0	0.1	0.18	18	936 755	366	
185/ 2W-22F 2 S 7-10-63	--	7.9	2790	200 9.98 29	99 8.14 24	375 16.31 47	2 0.05	0	256 4.20 12	217 4.52 13	862 24.31 70	111 1.79 5	0.5	0.11	25	2272 2017	907	
185/ 2W-22H 1 S 11- 1-63	71	7.0	1580	96 4.79 28	49 4.03 24	183 7.96 47	2 0.05	0	172 2.82 17	65 1.35 8	431 12.15 74	10 0.16 1	0.1	0.17	34	1057 955	441	
185/ 2W-22H 2 S 9-10-63	71	7.9	987	82 4.09 39	28 2.30 22	92 4.00 38	4 0.10 1	0	137 2.25 21	281 5.85 55	89 2.51 24	1.9 0.03	0.5	0.12	10	320 656	320	
185/ 2W-22L 1 S 12- 6-60	67	8.0	1030	67 3.34 33	25 2.06 21	104 4.52 45	4 0.10 1	0	192 3.15 31	56 1.17 11	212 5.98 56	0	0.1	0.03	26	550 589	270	
185/ 2W-22L 2 S 6-23-64	71	8.2	2558	164 8.18 33	77 6.33 25	233 10.13 41	8 0.20 1	0	232 3.80 15	116 2.42 10	635 17.91 73	29 0.47 2	0.4	0.11	--	1990 1377	726	
185/ 2W-22L 3 S 1-31-63	72	7.6	4500	373 18.61 38	150 12.34 25	420 18.26 37	4 0.10	0	354 5.80 12	351 7.31 15	1286 36.27 73	17 0.27 1	0.1	0.29	25	3092 2800	1549	
185/ 2W-22N 1 S 7-10-63	77	7.9	1685	141 7.04 37	61 5.02 27	154 6.70 36	3 0.08	0	189 3.10 17	83 1.73 9	486 13.71 74	6.8 0.11 1	0.3	0.03	25	1338 1053	603	
185/ 2W-22N 3 S 6-23-64	--	7.0	790	48 2.40 30	13 1.07 13	96 4.17 52	13 0.33 4	0	85 1.39 17	30 0.62 8	179 5.05 63	63 1.02 13	0.2	0.14	--	520 484	174	
185/ 2W-238 1 S 9-11-63	--	8.2	2530	184 9.18 32	92 7.57 27	263 11.44 40	3 0.08	0	207 3.39 12	141 2.94 10	784 22.11 78	1.2 0.02	0.6	0.28	22	1814 1593	838	
185/ 2W-238 2 S 9-11-63	--	7.7	1370	80 3.99 29	32 2.63 19	163 7.09 52	2 0.05	0	211 3.46 25	56 1.17 8	333 9.39 67	1.2 0.02	0.6	0.11	37	914 809	331	
185/ 2W-23G 1 S 7-10-63	73	8.1	1170	74 3.69 30	32 2.63 21	135 5.87 48	2 0.05	0	223 3.65 30	56 1.17 10	262 7.39 60	3.1 0.05	0.3	0.05	28	735 702	316	
185/ 2W-23H 2 S 7-10-63	--	7.9	1340	76 3.79 27	32 2.63 19	175 7.61 54	5 0.13 1	0	201 3.29 23	60 1.25 9	344 9.70 66	3.7 0.06	0.6	0.08	28	878 823	321	
185/ 2W-23H 3 S 7-10-63	74	7.6	1260	74 3.69 28	33 2.71 21	153 6.65 51	2 0.05	0	201 3.29 25	53 1.10 8	312 8.80 66	5.0 0.08 1	0.4	0.06	35	816 766	320	
185/ 2W-23M 1 S 7-10-63	73	8.0	932	76 3.79 41	6 0.49 5	114 4.96 53	3 0.08 1	0	186 3.05 32	28 0.58 6	206 5.81 61	2.5 0.04	0.2	0.05	31	570 558	214	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed
Date sampled																

OTAY HYDRO SUBUNIT				210B0				OTAY HYDRO UNIT				Z1000							
18S/ 2W-24F 11- 1-63	1	S	74 7.4	1600	80 3.99 23	40 3.29 19	228 9.91 57	3 0.08	0	247 4.05 24	93 1.94 11	390 11.00 65	0	0.2	0.30	31	1116 987	364	
18S/ 2W-24G 6-10-59	1	S	71 7.2	1565	77 3.84 28	36 2.96 22	153 6.65 49	2 0.05	0	233 3.82 27	47 0.98 7	331 9.33 66	0	0	0.14	30	987 791	340	
18S/ 2W-24J 6-10-59	1	S	74 7.3	1304	56 2.79 25	29 2.38 21	136 5.91 53	2 0.05	0	182 2.98 26	42 0.87 8	273 7.70 67	0	0	0	32	816 659	259	
18S/ 2W-24M 7-15-59	1	S	-- 7.5	1478	80 3.99 31	29 2.38 18	148 6.44 50	3 0.08 1	0	200 3.28 24	36 0.75 6	333 9.39 70	0	0.2	0	28	932 756	319	
18S/ 2W-24M 7-15-59	2	S	-- 7.6	1716	98 4.89 30	43 3.54 21	186 8.09 49	2 0.05	0	232 3.80 23	110 2.29 14	377 10.63 64	0	0.2	0.15	17	1124 947	422	
18S/ 2W-24M 3- 7-63	3	S	72 7.3	1590	93 4.64 25	39 3.21 17	240 10.44 57	3 0.08	0	242 3.97 22	110 2.29 13	418 11.79 65	0	0.4	0	28	1178 1050	393	
18S/ 2W-26B 1-30-63	1	S	73 7.8	1320	26 1.30 10	11 0.90 7	245 10.65 82	5 0.13 1	0	211 3.46 26	62 1.29 10	298 8.40 64	0	0.4	0.26	21	756 772	110	
18S/ 2W-260 1-20-63	1	S	-- 8.0	1460	67 3.34 24	17 1.40 10	213 9.26 66	2 0.05	0	188 3.08 22	62 1.29 9	250 7.05 50	161 2.60 19	0.4	--	--	736 865	237	
18S/ 2W-26E 2- 5-63	1	S	70 7.4	1400	79 3.94 29	32 2.63 19	165 7.17 52	1 0.03	0	195 3.20 22	143 2.98 21	296 8.35 57	0	0.4	0.20	25	868 837	329	
18S/ 2W-26H 1-30-63	1	S	73 7.6	2100	114 5.69 26	45 3.70 17	275 11.96 56	5 0.13 1	0	192 3.15 15	265 5.52 26	454 12.80 60	0	0.4	0.26	21	1322 1274	470	
18S/ 2W-27A 1-30-63	2	S	74 8.0	1380	65 3.24 26	32 2.63 21	155 6.74 53	2 0.05	0	210 3.44 27	62 1.29 10	282 7.95 63	0	0.2	0.19	28	772 730	294	
18S/ 2W-27G 9- 3-59	1	S	78 7.6	2640	156 7.78 33	75 6.17 26	225 9.78 41	4 0.10	0	192 3.15 13	166 3.46 14	638 17.99 73	0.7 0.01	0.1	0.06	32	1876 1391	698	
18S/ 2W-27H 1-30-63	1	S	70 7.6	1220	66 3.29 26	27 2.22 18	163 7.09 56	2 0.05	0	217 3.56 28	93 1.94 15	258 7.28 57	0	0.2	0.19	31	708 747	276	
18S/ 2W-27J 1-31-63	1	S	71 7.3	2900	174 8.68 27	84 6.91 22	375 16.31 51	3 0.08	0	274 4.49 14	219 4.56 14	800 22.56 71	11 0.18 1	0.2	0.45	28	1964 1829	780	
18S/ 2W-27L 3-28-51	1	S	-- --	--	--	--	--	--	--	--	--	552 15.57	--	--	--	--	--	--	
18S/ 2W-27L 8-12-59	3	S	-- 6.9	2630	171 8.53 34	75 6.17 25	237 10.30 41	6 0.15 1	0	232 3.80 15	173 3.60 14	634 17.88 71	0	0.7	0.06	22	1680 1432	736	
18S/ 2W-28G 9- 3-59	1	S	74 8.0	2030	95 4.74 23	36 2.96 14	292 12.70 62	8 0.20 1	0	250 4.10 20	127 2.64 13	493 13.90 67	1.9 0.03	0.2	0.21	24	1230 1200	385	
18S/ 2W-28L 3- 4-64	1	S	80 7.5	4371	226 11.28 25	121 9.95 22	547 23.78 53	6 0.15	0	341 5.59 12	213 4.43 10	1230 34.69 77	25 0.40 1	0.6	0.42	33	3002 2570	1062	
OULZURA HYDRO SUBUNIT				Z10C0															
17S/ 1E- 3A 8-27-54	1	S	-- 7.4	564	34 1.70 25	20 1.64 24	80 3.48 51	2 0.05 1	0	285 4.67 70	24 0.50 7	47 1.33 20	10.9 0.18 3	0.5	0.12	--	390 359	167	
17S/ 1E- 8K 3- 8-63	1	S	64 7.5	1800	60 2.99 15	56 4.61 23	290 12.61 62	2 0.05	0	274 4.49 23	89 1.85 9	477 13.45 68	7.0 0.11 1	0.8	0	44	1206 1161	380	
17S/ 1E- 9F 3- 8-63	1	S	72 7.5	890	39 1.95 21	28 2.30 25	113 4.91 53	2 0.05 1	0	2 0.03	38 0.79 12	202 5.70 87	0	0.4	0.10	17	642 440	213	
17S/ 1E-10A 3- 8-63	1	S	-- 7.1	1200	71 3.54 28	32 2.63 21	148 6.44 51	2 0.05	0	339 5.56 43	67 1.39 11	195 5.50 42	32 0.52 4	0.4	0.23	48	896 762	309	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃	
Date sampled																		

DULZURA HYDRO SUBUNIT				Z10C0		OTAY HYDRO UNIT					Z1000									
175/ 1E-10G 1 S 11- 6-63	--	7.7	1080	43 2.15 19	43 3.54 31	130 5.65 49	3 0.08 1	0	212 3.47 31	73 1.52 13	216 6.09 54	11 0.18 2	0.4	0.19	41	762	285 665			
175/ 1E-14M 1 S 3-21-63	72	7.5	540	32 1.60 28	16 1.32 23	63 2.74 48	1 0.03 1	0	189 3.10 57	18 0.37 7	71 2.00 36	0.5 0.01	0.2	0.09	28	334	146 323			
175/ 1E-15H 1 S 9- 9-57	--	7.4	851	42 2.10 26	25 2.06 25	91 3.96 48	2 0.05 1	0	214 3.51 43	30 0.62 8	138 3.89 48	6.8 0.11 1	0.1	0.07	31	572	208 471			
175/ 1E-25A 1 S 3- 8-63	--	7.5	735	49 2.45 28	27 2.22 25	93 4.04 46	1 0.03	0	220 3.61 42	41 0.85 10	140 3.95 46	9.0 0.15 2	0.4	0	43	560	234 512			
175/ 1E-26J 1 S 3- 8-63	68	7.6	730	50 2.50 29	27 2.22 25	91 3.96 45	1 0.03	0	223 3.65 43	58 1.21 14	123 3.47 41	7.0 0.11 1	0.4	0	23	544	236 490			
175/ 1E-35D 1 S 5- 5-58	64	7.4	590	33 1.65 29	16 1.32 23	64 2.78 48	1 0.03 1	--	162 2.66 47	39 0.81 14	79 2.23 39	0.8 0.01	0.3	0	30	351	149 343			
175/ 2E- 3N 1 S 3- 8-63	--	7.4	580	28 1.40 23	22 1.81 29	67 2.91 47	1 0.03	0	180 2.95 47	38 0.79 12	92 2.59 41	0.0	0.4	0.05	39	398	161 376			
175/ 2E- 5M 1 S 3- 8-63	54	7.4	620	46 2.30 35	17 1.40 22	64 2.78 43	1 0.03	0	195 3.20 49	35 0.73 11	94 2.65 40	0.0	1.0	0	34	416	185 388			
175/ 2E- 6D 1 S 3- 8-63	--	7.3	600	40 2.00 30	19 1.56 24	69 3.00 46	1 0.03	0	220 3.61 53	46 0.96 14	74 2.09 31	8.0 0.13 2	0.6	0.05	44	412	178 410			
175/ 2E-10A 1 S 3- 8-63	60	6.9	1700	163 8.13 42	55 4.52 23	155 6.74 35	5 0.13 1	0	281 4.61 24	132 2.75 14	390 11.00 58	47 0.76 4	0.2	0.05	36	1176	633 1121			
175/ 2E-29J 1 S 4-28-64	61	7.4	963	68 3.39 35	22 1.81 19	103 4.48 46	3 0.08 1	0	233 3.82 39	51 1.06 11	177 4.99 51	0.6 0.01	1.2	0.16	44	577	260 584			
175/ 2E-32D 1 S 3-21-63	70	7.7	1460	91 4.54 31	40 3.29 22	160 6.96 47	3 0.08 1	0	348 5.70 39	74 1.54 10	268 7.56 51	0	0.2	0.17	25	894	392 832			
185/ 2E- 3P 1 S 7- 2-58	68	7.2	1288	95 4.74 36	44 3.62 28	106 4.61 35	4 0.10 1	0	311 5.10 40	85 1.77 14	162 4.57 36	79.4 1.28 10	0.2	0.10	43	805	418 772			
185/ 2E-10E 1 S 3-21-63	--	--	7400	35 1.75 19	27 2.22 25	116 5.04 56	2 0.05 1	0	250 4.10 47	88 1.83 21	99 2.79 32	5.0 0.08 1	0.4	0.14	48	582	199 543			
185/ 2E-10M 2 S 3-21-63	58	7.7	720	41 2.05 27	22 1.81 24	81 3.52 47	3 0.08 1	0	232 3.80 50	41 0.85 11	91 2.57 34	21 0.34 4	0.4	0.11	49	472	193 464			
175/ 1W-25A 1 S 3- 8-63	64	7.6	658	30 1.50 20	19 1.56 21	101 4.39 59	1 0.03	0	124 2.03 28	15 0.31 4	175 4.94 68	0.0	0.1	0	9	444	153 411			
TIA JUANA HYDRO SUBUNIT				Z11A0		TIA JUANA HYDRO UNIT					Z1100									
185/ 1W-26L 1 S 5- 5-58	78	7.4	1732	60 2.99 18	6 0.49 3	299 13.00 78	8 0.20 1	0	183 3.00 20	47 0.98 6	400 11.28 74	1.5 0.02	0.2	0.18	22	1115	174 934			
185/ 1W-31H 1 S 5- 5-58	91	7.2	2266	42 2.10 10	1 0.08	437 19.00 88	16 0.41 2	0	43 0.70 3	104 2.17 10	700 19.74 87	0	2.1	0.70	18	1473	109 1342			
185/ 1W-34F 1 S 3- 7-63	--	8.0	1630	35 1.75 10	0 15.65 89	360 0.23 1	9	0	30 0.49 3	81 1.69 10	534 15.06 87	0.0	3.0	1.08	12	984	68 1050			
185/ 1W-34N 1 S 9- 1-59	83	7.1	2080	54 2.69 14	1 0.08	391 17.00 86	2 0.05	0	49 0.80 4	43 0.90 4	651 18.36 92	0.2	2.6	1.07	200	1314	139 1370			
185/ 2W-27R 2 S 1-31-63	--	7.7	2850	192 9.58 31	62 5.10 17	370 16.09 52	3 0.08	0	439 7.20 24	222 4.62 15	656 18.90 61	6.0 0.10	0.6	0.43	21	1830	735 1749			
185/ 2W-28P 1 S 8-11-53	97	7.9	1730	32 1.60 9	31 2.55 14	316 13.74 77	--	--	323 5.29 31	169 3.52 20	298 8.40 49	1.6 0.03	0.8	0.38	--	1071	208 1008			

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value										Chemical constituents in parts per million							
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃				
Date sampled																					
TIA JUANA HYDRO SUBUNIT				TIA JUANA HYDRO UNIT										21100							
185/ 2W-29N 1 S 1-29-63	--	8.1	6000	311 15.52 24	146 12.01 19	850 36.96 57	5 0.13	0	342 5.61 9	274 5.70 9	1871 52.76 82	0	0.4	0.52	30	4088	1378 3656				
185/ 2W-29P 1 S 1-29-63	--	8.0	4500	204 10.18 21	113 9.29 19	662 28.78 60	4 0.10	0	311 5.10 11	226 4.71 10	1357 38.27 79	4.0 0.06	0.4	0.55	29	2938	974 2753				
185/ 2W-29P 2 S 1-29-63	--	8.1	4600	209 10.43 22	97 7.98 17	675 29.35 61	3 0.08	0	374 6.13 13	232 4.83 10	1287 36.29 77	10 0.16	0.4	0.50	34	2974	921 2732				
185/ 2W-29P 4 S 1-29-63	69	8.1	4600	236 11.78 24	98 8.06 16	688 29.91 60	5 0.13	0	351 5.75 12	220 4.58 9	1365 38.49 79	8.0 0.13	0.4	0.52	32	3096	993 2825				
185/ 2W-29P 5 S 4-11-63	--	7.8	5300	242 12.08 22	126 10.36 18	770 33.48 60	9 0.23	0	300 4.92 9	263 5.48 10	1605 45.26 81	23 0.37 1	0.2	0.61	26	3813	1123 3212				
185/ 2W-32H 1 S 3- 5-64	68	7.5	10549	452 22.55 19	301 24.75 21	1596 69.39 59	12 0.31	0	547 8.97 8	737 15.34 13	3250 91.65 79	3.7 0.06	1.0	0.90	27	7313	2367 6650				
185/ 2W-32N 1 S 8-10-53	--	7.9	5850	178 8.88	168 13.82	890 38.70	--	--	336 5.51	275 5.73	1775 50.06	--	1.0	0.70	--		1136 4052				
185/ 2W-32P 1 S 10-23-57	70	7.5	5730	139 6.94 11	113 9.29 15	1047 45.52 73	21 0.54 1	0	928 15.21 25	492 10.24 17	1246 35.14 58	0	0.7	0.70	28	3620	812 3544				
185/ 2W-32P 4 S 3- 3-64	68	7.0	29412	774 38.62 11	1025 84.30 24	5340 232.18 65	134 3.43 1	0	330 5.41 2	1499 31.21 9	11375 320.78 90	5.6 0.09	1.1	1.16	24	22842	6151 20341				
185/ 2W-320 1 S 3- 3-64	68	6.6	16670	880 43.91 23	531 43.67 23	2376 103.31 54	17 0.43	0	219 3.59 2	791 16.47 9	6025 169.91 89	6.2 0.10	0.9	0.54	21	13380	4383 10756				
185/ 2W-320 3 S 3-25-55	66	7.4	4880	308 15.37 33	123 10.12 22	490 21.31 45	6 0.15	0	350 5.74 12	218 4.54 10	1290 36.38 78	2.5 0.04	0.3	0.04	--		1276 2360 2610				
185/ 2W-32R 1 S 8-18-55	--	7.6	3355	238 11.88 32	114 9.38 25	360 15.65 42	4 0.10	0	325 5.33 15	178 3.71 10	975 27.50 75	1.0 0.02	0.7	0.26	--		1064 2450 2031				
185/ 2W-33J 1 S 8-12-53	63	8.0	2330	146 7.29 32	57 4.69 20	255 11.09 48	--	--	354 5.80 25	227 4.73 20	450 12.69 55	0.6 0.01	0.8	0.28	--		599 1479 1311				
185/ 2W-33K 4 S 6-23-64	69	7.7	4227	297 14.82 32	127 10.44 23	466 20.26 44	12 0.31 1	0	407 6.67 15	612 12.74 28	940 26.51 58	1.0 0.02	0.9	0.47	--		3092 1264 2656				
185/ 2W-33L 5 S 3- 4-64	70	7.6	4805	296 14.77 29	133 10.94 22	561 24.39 48	8 0.20	0	510 8.36 17	391 8.14 16	1195 33.70 67	8.7 0.14	0.8	1.00	--		3217 1287 2845				
185/ 2W-33L 6 S 11- 4-58	--	--	3420	--	--	--	--	--	--	--	637 17.96	--	--	--	--						
185/ 2W-33L 7 S 6- 6-57	--	7.2	3150	186 9.28 28	85 6.99 21	396 17.22 51	5 0.13	0	478 7.83 23	454 9.45 28	586 16.53 49	0	0.3	0.46	22	2150	814 1970				
185/ 2W-33M 2 S 4-25-61	70	7.4	5900	439 21.91 34	165 13.57 21	648 28.18 44	8 0.20	0	345 5.65 9	375 7.81 13	1738 49.01 78	0	0.5	0.49	23	3722	1775 3567				
185/ 2W-33M 4 S 4-26-61	71	7.4	8230	581 28.99 35	255 20.97 25	753 32.74 40	7 0.18	0	287 4.70 6	356 7.41 9	2542 71.68 85	16 0.26	0.8	0.26	23	5525	2500 4675				
185/ 2W-33N 2 S 4-16-63	68	7.3	5300	433 21.61 35	153 12.58 21	613 26.65 44	5 0.13	0	300 4.92 8	879 18.30 31	1298 36.60 61	0	0.4	0.39	12	4920	1711 3541				
185/ 2W-33P 1 S 11-19-62	68	7.3	4100	314 15.67 36	106 8.72 20	425 18.48 43	6 0.15	0	333 5.46 13	695 14.47 33	835 23.55 54	9.3 0.15	0.9	0.10	19	2746	1220 2574				
185/ 2W-33P 5 S 10-26-61	67	7.3	4500	321 16.02 33	120 9.87 20	517 22.48 46	2 0.05	0	342 5.61 12	391 8.14 17	1208 34.07 71	0	0.2	0.35	16		1296 3578 2744				
185/ 2W-33P 7 S 11-19-62	69	7.6	4580	239 11.93 28	110 9.05 21	497 21.61 51	7 0.18	0	378 6.20 13	607 12.64 26	1042 29.38 61	6.8 0.11	0.8	0.16	21	3042	1050 2717				

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃

TIA JUANA HYDRO SUBUNIT				TIA JUANA HYDRO UNIT									Z1100						
				Z11A0															
185/ 2W-34A 1 S 6- 6-57	--	7.3	5040	262 13.07 24	132 10.86 20	649 28.22 52	70 1.79 3	0	575 9.42 18	309 6.43 12	1305 36.80 70	11 0.18	0.6	0.56	26	3300 3048	1197		
185/ 2W-34A 2 S 1-31-63	70	7.8	2700	180 8.98 29	63 5.18 17	375 16.31 53	3 0.08	0	483 7.92 26	181 3.77 12	674 19.01 62	7.0 0.11	0.4	0.52	22	1850 1743	707		
185/ 2W-34F 1 S 6-22-64	68	7.3	6800	373 18.61 24	152 12.58 16	1070 46.52 60	10 0.26	0	616 10.10 13	850 17.70 23	1798 50.70 65	0	0.4	1.00	--	4662 4558	1561		
185/ 2W-34L 2 S 6-22-64	70	7.7	5400	329 16.42 26	117 9.62 15	860 37.39 59	8 0.20	0	594 9.74 15	939 19.55 31	1149 32.40 52	74 1.19 2	0.2	0.83	--	3820 3769	1303		
185/ 2W-34L 4 S 8-12-53	59	7.8	2270	120 5.99 27	55 4.52 21	264 11.48 52	--	0	342 5.61 26	176 3.71 17	422 11.90 56	11.1 0.18 1	1.0	0.27	--	1346 1219	526		
185/ 2W-34P 1 S 6-22-64	69	7.4	1900	323 16.12 36	90 7.40 17	475 20.65 47	6 0.15	0	348 5.70 13	735 15.30 35	798 22.50 52	8 0.13	0.6	0.43	--	2750 2607	1177		
185/ 2W-34P 2 S 8-12-53	59	7.8	2210	98 4.89 23	64 5.26 25	246 10.70 51	--	--	366 6.00 30	127 2.64 13	404 11.39 56	7.9 0.13 1	1.1	0.29	--	1301 1126	508		
185/ 2W-350 1 S 5-17-51	--	--	--	--	--	--	--	--	--	--	552 15.57	--	--	--	--	--	--		
185/ 2W-35F 1 S 2- 8-62	--	7.8	2350	78 3.89 16	55 4.52 18	370 16.09 65	5 0.13 1	0	314 5.15 21	180 3.75 15	555 15.65 64	0	0.4	0.45	14	1528 1412	421		
185/ 2W-35K 1 S 2- 6-63	--	7.5	3000	188 9.38 28	80 6.58 20	395 17.17 52	3 0.08	0	529 8.67 26	211 4.39 13	693 19.54 60	14 0.23 1	0.8	0.50	21	1954 1866	799		
185/ 2W-35L 1 S 10-31-63	--	7.6	4500	303 15.12 29	105 8.64 17	630 27.39 53	9 0.23	0	546 8.95 18	315 6.56 13	1259 35.50 70	0	0.1	0.69	21	3122 2911	1189		
185/ 2W-35N 2 S 8-12-53	61	7.9	2300	126 6.29 25	58 4.77 19	322 14.00 56	--	0	375 6.15 25	110 2.29 9	557 15.71 65	1.7 0.03	1.0	0.25	--	1504 1360	553		
185/ 2W-35R 2 S 8-12-59	70	7.6	--	59 2.94 14	30 2.47 12	361 15.70 74	5 0.13 1	0	265 4.34 21	154 3.21 16	464 13.08 63	2.2 0.04	0.4	0.47	22	1215 1228	271		
185/ 2W-36R 1 S 8-11-59	--	7.5	3820	127 6.34 18	51 4.19 12	561 24.39 70	6 0.15	0	206 3.38 9	196 4.08 11	1014 28.59 79	0	0.5	0.78	24	2295 2081	527		
195/ 1W- 3E 1 S 9- 1-59	83	7.9	2070	69 3.44 18	0	963 15.78 82	4 0.10 1	0	27 0.44 2	79 1.64 8	613 17.29 69	1.4 0.02	4.9	0.97	18	1213 1166	172		
195/ 2W- 1E 1 S 8-12-53	61	8.0	2370	114 5.69 26	62 5.10 23	264 11.48 52	--	--	366 6.00 28	129 2.69 13	447 12.61 59	8.8 0.14 1	0.8	0.28	--	1408 1206	540		
195/ 2W- 1E 4 S 11-18-58	68	7.7	3820	224 11.18 29	91 7.48 19	460 20.00 52	6 0.15	0	421 6.90 17	284 5.91 15	950 26.79 68	0	0.7	0.72	21	2544 2244	934		
195/ 2W- 1E 8 S 11-18-58	68	7.5	5663	295 14.72 26	121 9.95 17	741 32.22 56	9 0.23	0	518 8.49 15	446 9.29 16	1414 39.87 69	0	0.6	0.64	22	3744 3304	1234		
195/ 2W- 1G 2 S 8-12-53	--	7.7	3760	182 9.08 25	113 9.29 26	406 17.65 49	--	--	415 6.80 19	203 4.23 12	850 23.97 68	1.2 0.02	1.1	0.45	--	919 2399 1961	919		
195/ 2W- 1J 2 S 8-11-53	63	8.1	2900	198 9.88 31	66 5.43 17	374 16.26 52	--	0	415 6.80 22	213 4.43 14	691 19.49 63	14.6 0.24 1	1.0	0.37	--	766 2025 1762	766		
195/ 2W- 1M 9 S 12- 6-60	68	7.8	2860	159 7.93 28	63 5.18 18	342 14.67 53	6 0.15 1	0	427 7.00 25	221 4.60 17	566 15.96 57	14 0.23 1	0.8	0.65	19	1490 1601	656		
195/ 2W- 1M11 S 8-12-59	73	7.8	2780	182 9.08 30	76 5.25 20	350 15.22 50	6 0.15	0	375 6.15 20	252 5.25 17	702 19.80 63	12 0.19 1	0.6	0.20	21	1898 1786	767		
195/ 2W- 1M14 S 12- 6-60	68	8.0	2525	148 7.39 29	51 4.19 17	305 13.26 53	11 0.28 1	0	378 6.20 25	196 4.08 16	518 14.61 58	5.4 0.07	0.9	0.53	19	579 1208 1441	579		

State well number	Temp. when	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million					
	samplerd in °F			Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Evap 105°C Computed	Total hardness as CaCO ₃
Date samplerd																	

TIA JUANA HYDRO SUBUNIT				Z11A0				TIA JUANA HYDRO UNIT				Z1100							
195/ 2W- 1N 4 5	69	7.6	2300	127	50	283	6	0	348	152	489	5.6	1.1	0.16	25	1371	523		
4-25-61				6.34	4.11	12.30	0.15		5.70	3.16	13.79	0.09							
				28	18	54	1		25	14	61						1310		
195/ 2W- 1N 6 5	--	8.2	1550	45	32	245	9	0	302	128	279	0	0.2	0.36	50	880	244		
10-31-63				2.25	2.63	10.65	0.23		4.95	2.66	7.87								
				14	17	68	1		32	17	51						937		
195/ 2W- 2D 1 5	61	7.9	2410	128	48	270	--	--	342	126	474	2.0	0.9	0.30	--		517		
P-12-53				6.39	3.95	11.74			5.61	2.62	13.37	0.03					1422		
				29	18	53			26	12	62						1217		
195/ 2W- 2E 1 5	69	7.4	3390	210	82	409	8	0	360	361	722	69	1.0	0.22	22	2137	862		
4-25-61				10.48	6.74	17.78	0.20		5.90	7.52	20.36	1.11							
				30	19	51	1		17	22	58	3					2061		
195/ 2W- 2K 1 5	61	7.9	2670	146	61	391	--	--	400	169	635	7.4	1.2	0.40	--		616		
8-12-53				7.29	5.02	17.00			6.56	3.52	17.91	0.12					1754		
				25	17	58			23	13	64						1608		
195/ 2W- 2L 3 5	61	8.1	3390	154	70	438	--	0	396	203	733	5.8	1.2	0.48	--		673		
8-11-53				7.68	5.76	19.04			6.49	4.23	20.67	0.09					2000		
				24	18	59			21	13	66						1800		
195/ 2W- 2L 5 5	61	7.6	3630	152	69	541	--	--	530	232	755	3.9	1.3	0.55	--		663		
8-11-53				7.58	5.67	23.52			8.69	4.83	21.29	0.06					2069		
				21	15	64			25	14	61						2015		
195/ 2W- 2R 1 5	61	7.7	3700	182	84	568	--	--	473	249	940	20.8	1.2	0.62	--		800		
8-12-53				9.08	6.91	24.70			7.75	5.18	26.51	0.34					2445		
				22	17	61			19	13	67	1					2278		
195/ 2W- 3A 1 5	--	7.7	2130	187	80	370	8	0	339	309	709	6.2	1.0	0.14	22	1924	796		
4-12-60				9.33	6.58	16.09	0.20		5.56	6.43	19.99	0.10							
				29	20	50	1		17	20	62						1859		
195/ 2W- 3B 1 5	63	7.9	2860	190	82	375	--	--	497	276	631	2.0	1.0	0.38	--		812		
8-12-53				9.48	6.74	16.31			8.15	5.75	17.79	0.03					1991		
				29	21	50			26	18	56						1802		
195/ 2W- 3D 2 5	59	7.6	2130	116	48	228	--	--	366	108	383	1.1	0.9	0.30	--		487		
8-12-53				5.79	3.95	9.91			6.00	2.25	10.80	0.02					1247		
				29	20	50			31	12	57						1065		
195/ 2W- 3D 3 5	59	7.8	2660	142	59	282	--	0	403	221	444	14.9	0.9	0.30	--		597		
8-12-53				7.09	4.85	12.26			6.61	4.60	12.52	0.24					1400		
				29	20	51			28	19	52	1					1362		
195/ 2W- 3G 1 5	59	7.8	2350	148	62	306	--	--	408	194	510	1.5	1.1	0.33	--		625		
8-12-53				7.39	5.10	13.30			6.69	4.04	14.38	0.02					1579		
				29	20	52			27	16	57						1424		
195/ 2W- 3R 3 5	72	7.3	1795	93	47	197	4	0	241	240	305	5.0	0.3	0.10	39	1119	426		
9- 2-59				4.64	3.87	8.57	0.10		3.95	5.00	8.60	0.08							
				27	23	50	1		22	28	49						1049		
195/ 2W- 4A 5 5	68	7.6	2350	119	52	283	3	0	289	199	477	0	0.6	0.37	19		511		
4-25-61				5.94	4.28	12.30	0.08		4.74	4.14	13.45						1710		
				26	19	54			21	19	60						1295		
195/ 2W- 4C 2 5	68	7.7	4000	265	83	650	5	0	497	510	1071	27	0.4	0.63	19		1003		
10-24-61				13.22	6.83	28.26	0.13		8.15	10.62	30.20	0.44					3018		
				27	14	58			16	21	61	1					2875		
195/ 2W- 4D 1 5	--	7.7	4600	309	124	588	9	0	388	430	1252	0	0.4	0.53	17	3380	1282		
8-21-63				15.42	10.20	25.57	0.23		6.36	8.95	35.31								
				30	20	50			13	18	70						2921		
195/ 2W- 4D 4 5	70	7.3	4000	286	21	475	2	0	325	370	1023	0	0.3	0.42	24		801		
4-18-62				14.27	1.73	20.65	0.05		5.33	7.70	28.85						2748		
				39	5	56			13	18	69						2362		
195/ 2W- 4F 3 5	66	7.5	2160	142	54	251	8	0	336	194	425	10.7	0.5	0.12	30	1347	577		
8-12-59				7.09	4.44	10.91	0.20		5.51	4.04	11.99	0.17							
				31	20	48	1		25	19	55	1					1281		
195/ 2W- 4F 4 5	68	7.5	3525	220	100	386	1	0	415	514	645	31	0.8	0.14	24	2229	961		
11-20-62				10.98	8.22	16.78	0.03		6.80	10.70	18.19	0.50							
				30	23	47			19	30	50	1					2126		
195/ 2W- 4H 4 5	57	7.8	3640	194	90	449	--	--	530	304	751	3.7	0.9	0.50	--		855		
8-11-53				9.68	7.40	19.52			8.69	6.33	21.18	0.06					2171		
				26	20	53			24	17	58						2054		
195/ 2W- 4H 7 5	72	7.6	2090	49	46	335	13	0	382	256	330	0	0.6	0.45	--	1275	312		
6-23-64				2.45	3.78	14.57	0.33		6.26	5.33	9.31								
				12	18	69	2		30	26	45						1218		
195/ 2W- 4J 7 5	--	--	4700	--	--	--	--	--	--	--	1148	--	--	--	--				
1- 7-58											32.37								

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value								Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C as Computed
Date sampled																

TIA JUANA HYDRO SUBUNIT

211A0

TIA JUANA HYDRO UNIT

21100

195/ 2W- 4K 2 S	--	7.1	1680	82	39	223	--	0	183	156	365	1.6	1.3	0.28	--		365
9- 3-53				4.09	3.21	9.70			3.00	3.25	10.29	0.03				1144	958
				24	19	57			18	20	62						
195/ 2W- 4L 1 S	68	7.4	3400	295	100	465	4	0	433	662	752	43	0.2	0.63	19	2870	1148
11- 1-63				14.72	8.22	20.22	0.10		7.10	13.78	21.21	0.69				2594	
				34	19	47			17	32	50	2					
195/ 2W- 4L 4 S	--	7.6	1980	186	54	148	3	0	257	354	314	0	0.6	0.18	31	1310	687
6- 6-57				9.28	4.44	6.44	0.08		4.21	7.37	8.85					1217	
				46	22	32			21	36	43						
195/ 2W- 5A 3 S	68	7.2	4458	82	95	587	19	0	95	23	1375	53	0.3	0.14	--	2504	600
3- 5-64				4.09	7.90	25.52	0.49		1.56	0.48	38.76	0.85				2282	
				11	21	67	1		4	1	93	2					
195/ 2W- 5B 6 S	67	7.6	9524	570	282	1173	10	0	255	454	3140	6.2	0.9	0.34	25	6870	2584
3- 3-64				28.44	23.19	51.00	0.26		4.18	9.45	88.55	0.10				5787	
				28	23	50			4	9	87						
195/ 2W- 5C 2 S	--	--	3530	--	--	--	--	--	--	--	713	--	--	--	--		
12- 3-57											20.11						
195/ 2W- 5C 6 S	68	7.3	23419	670	733	4325	40	0	354	1267	8900	6.2	0.9	1.15	22	17580	4689
3- 4-64				33.43	60.28	188.05	1.02		5.80	26.38	250.98	0.10				16139	
				12	21	67			2	9	89						
195/ 2W- 5G 3 S	--	--	7150	--	--	--	--	--	--	--	1960	--	--	--	--		
10- 1-57											55.27						
195/ 2W- 5G 5 S	66	7.3	4808	252	107	740	5	0	495	420	1320	3.0	1.2	0.66	--	1069	
3-17-55				12.57	8.80	32.18	0.13		8.11	8.74	37.22	0.05				3145	
				23	16	60			15	16	69					3092	
195/ 2W- 5G18 S	68	7.3	8651	432	242	1175	8	0	156	515	2790	5.6	0.9	0.54	16	6009	2075
3- 4-64				21.56	19.90	51.09	0.20		2.56	10.72	78.68	0.09				5262	
				23	21	55			3	12	85						
195/ 2W- 5K 1 S	69	7.2	5200	270	133	690	6	--	375	577	1300	--	0.9	0.47	30	3469	1221
6-25-58				13.47	10.94	30.00	0.15		6.15	12.01	36.66						
195/ 2W- 5L 2 S	70	7.3	9833	464	271	1346	18	0	325	541	3075	6.2	0.9	0.60	21	7493	2274
3- 4-64				23.15	22.29	58.52	0.46		5.33	11.26	86.72	0.10				5904	
				22	21	56			5	11	84						
195/ 2W- 5O 2 S	69	7.3	2900	236	66	340	5	0	296	346	691	0	0.4	0.41	29	1920	861
11- 1-63				11.78	5.43	14.78	0.13		4.85	7.20	19.49					1859	
				37	17	46			15	23	62						
195/ 2W- 5O 3 S	70	7.9	5860	467	109	708	6	0	299	658	1581	12	1.0	0.24	32	4086	1614
11-20-62				23.30	8.96	30.78	0.15		4.90	13.70	44.58	0.19				3721	
				37	14	49			8	22	70						
POTRERO HYDRO SUBUNIT				211B0													
175/ 4E-30P 1 S	--	7.5	425	23	11	48	3	0	134	6	55	19	0.3	0.04	52	251	103
8-11-62				1.15	0.90	2.09	0.08		2.20	0.12	1.55	0.31				283	
				27	21	50	2		53	3	37	7					
185/ 2E-14C 1 S	--	7.2	555	24	20	66	2	0	212	25	61	1.0	0.6	0.08	57	360	142
6-24-64				1.20	1.64	2.87	0.05		3.47	0.52	1.72	0.02				361	
				21	28	50	1		61	9	30						
185/ 2E-14E 1 S	80	7.4	1825	95	60	199	2	0	426	142	297	0	0.6	0.45	44	1185	484
7- 2-58				4.74	4.93	8.65	0.05		6.98	2.96	8.38					1049	
				26	27	47			38	16	46						
185/ 3E- 7N 1 S	--	7.4	917	72	26	79	3	0	217	49	160	2.5	1.0	0.07	26	570	287
6-25-64				3.59	2.14	3.43	0.08		3.56	1.02	4.51	0.04				525	
				39	23	37	1		39	11	49						
185/ 4E- 8Q 1 S	--	7.1	485	35	12	52	2	0	198	8	60	3.3	0.2	0.05	35	355	137
9- 9-57				1.75	0.99	2.26	0.05		3.25	0.17	1.69	0.05				305	
				35	20	45	1		63	3	33	1					
185/ 4E-18C 1 S	72	7.3	482	38	17	28	1	0	173	11	45	13.4	0	0.05	62	285	165
7-10-58				1.90	1.40	1.22	0.03		2.84	0.23	1.27	0.22				300	
				42	31	27	1		62	5	28	5					
185/ 4E-18J 1 S	--	7.5	528	42	20	32	--	--	247	14	46	6.8	0.3	0.09	--	187	
9-16-53				2.10	1.64	1.39			4.05	0.29	1.30	0.11				388	
				41	32	27			70	5	23	2				283	

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million											
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃							
BARRETT LAKE HYDRO SUBUNIT				TIA JUANA HYDRO UNIT																				
				211C0																21100				
17S/ 2E-12M 1 S	64	7.2	630	74	21	48	1	0	259	34	91	4.0	0.1	0	36	466	271							
3- 8-63				3.69	1.73	2.09	0.03		4.25	0.71	2.57	0.06												
				49	23	28			56	9	34	1					436							
17S/ 3E- 4L 1 S	--	7.3	980	68	27	99	1	0	302	45	131	14	0.7	0.07	53	561	281							
8- 8-62				3.39	2.22	4.30	0.03		4.95	0.94	3.69	0.23												
				34	22	43			50	10	38	2					587							
MONUMENT HYDRO SUBUNIT				21100																				
15S/ 4E-25C 1 S	60	7.0	412	34	14	34	2	0	114	67	32	6.0	0.2	0.03	26	254	143							
7- 2-62				1.70	1.15	1.48	0.05		1.87	1.39	0.90	0.10												
				39	26	34	1		44	33	21	2					271							
15S/ 4E-26J 1 S	60	7.0	523	47	12	43	2	0	146	56	63	4.0	0.6	0.12	22	328	167							
7- 2-62				2.35	0.99	1.87	0.05		2.39	1.17	1.78	0.06												
				45	19	36	1		44	22	33	1					321							
15S/ 4E-36F 1 S	58	6.9	514	45	18	35	1	--	192	38	40	7.4	0.4	0	30	326	187							
5-14-58				2.25	1.48	1.52	0.03		3.15	0.79	1.13	0.12												
				43	28	29	1		61	15	22	2					309							
15S/ 5E- 30S1 S	48	7.6	372	42	11	18	3	0	166	30	21	1.5	0.2	0	38	254	150							
4-29-64				2.10	0.90	0.78	0.08		2.72	0.62	0.59	0.02												
				54	23	20	2		69	16	15	1					246							
15S/ 5E-15L 1 S	--	6.7	251	24	9	12	1	0	95	--	22	18.6	0.1	0	--		97							
7-23-53				1.20	0.74	0.52	0.03		1.56		0.62	0.30					132							
COTTONWOOD HYDRO SUBUNIT				211F0																				
16S/ 5E- 6M 1 S	--	6.6	271	16	10	22	1	0	79	17	33	4.8	0.2	0	39	205	81							
4-29-64				0.80	0.82	0.96	0.03		1.29	0.35	0.93	0.08												
				31	31	37	1		49	13	35	3					182							
16S/ 5E- 6M 2 S	--	7.6	247	16	10	20	1	0	100	1	29	1.2	0.2	0.02	2	135	81							
4-29-64				0.80	0.82	0.87	0.03		1.64	0.02	0.82	0.02												
				32	33	35	1		66	1	33	1					130							
16S/ 5E-17LS1 S	--	8.0	976	94	21	76	4	--	238	79	150	0.6	0.8	1.40	--	585	321							
10-30-53				4.69	1.73	3.30	0.10		3.90	1.64	4.23	0.01												
				48	18	34	1		40	17	43						544							
16S/ 5E-29P 1 S	77	7.5	493	34	18	44	2	0	219	24	35	0	0.4	0	35	361	159							
7-23-58				1.70	1.48	1.91	0.05		3.59	0.50	0.99													
				33	29	37	1		71	10	19						300							
17S/ 5E- 4C 2 S	--	7.1	866	87	36	56	3	0	117	329	35	0.5	0.6	0.10	40	660	365							
6-26-64				4.34	2.96	2.43	0.08		1.92	6.85	0.99	0.01												
				44	30	25	1		20	70	10						645							
17S/ 5E- 50 1 S	--	7.5	700	57	21	63	4	0	310	33	59	6.0	0.2	0.07	29	408	229							
7- 3-62				2.84	1.73	2.74	0.10		5.08	0.69	1.66	0.10												
				38	23	37	1		67	9	22	1					425							
17S/ 5E- 8R 1 S	--	7.0	400	28	11	38	4	0	203	9	46	14	0.4	0.05	32	264	115							
7- 3-62				1.40	0.90	1.65	0.10		3.33	0.19	1.30	0.23												
				35	22	41	2		66	4	26	5					282							
17S/ 5E-10N 1 S	64	7.1	418	25	11	43	4	0	184	0	38	0	0.2	0	30	301	108							
7-24-58				1.25	0.90	1.87	0.10		3.02		1.07													
				30	22	45	2		74		26						242							
CAMERON HYDRO SUBUNIT				211G0																				
17S/ 5E- 1K 1 S	68	7.2	469	33	10	37	4	0	228	66	29	19	0.2	0.08	27	378	124							
7-24-58				1.65	0.82	1.61	0.10		3.74	1.37	0.82	0.31												
				39	20	39	2		60	22	13	5					337							
17S/ 5E- 2N 1 S	--	7.7	769	68	27	61	2	0	382	36	43	0	0.3	0.08	30	469	281							
10-20-57				3.39	2.22	2.65	0.05		6.26	0.75	1.21													
				41	27	32	1		76	9	15						455							
17S/ 5E- 3R 1 S	86	7.6	532	52	19	48	3	0	256	40	40	1.5	0.8	0.04	--		208							
7-14-53				2.59	1.56	2.09	0.08		4.20	0.83	1.13	0.02												
				41	25	33	1		68	13	18						362							
																	330							

State well number	Temp. when sampled in °F	pH	Specific conductance (micromhos at 25°C)	Chemical constituents in parts per million equivalents per million percent reactance value									Chemical constituents in parts per million				
				Calcium Ca	Magnesium Mg	Sodium Na	Potassium K	Carbonate CO ₃	Bicarbonate HCO ₃	Sulfate SO ₄	Chloride Cl	Nitrate NO ₃	Fluoride F	Boron B	Silica SiO ₂	TDS Evap 180°C Computed	Total hardness as CaCO ₃
Date sampled																	

CAMPO HYDRO SUBUNIT				TIA JUANA HYDRO UNIT														21100					
				Z11H0																			
175/ 5E-24F 1 S	--	8.0	348	24	10	37	2	0	176	5	23	2.0	0.6	0.05	37	230	101						
6-26-64				1.20	0.82	1.61	0.05		2.88	0.10	0.65	0.03											
				33	22	44	1		79	3	18	1				227							
175/ 5E-36B 1 S	62	7.5	337	26	7	37	2	0	160	4	30	2.8	0.5	0.03	33	228	94						
4-28-64				1.30	0.58	1.61	0.05		2.62	0.08	0.85	0.05											
				37	16	45	1		73	2	24	1				221							
175/ 6E-13M 1 S	--	7.6	341	24	7	37	2	0	137	4	37	6.8	0.3	0	34	182	89						
8- 7-62				1.20	0.58	1.61	0.05		2.25	0.06	1.04	0.11											
				35	17	47	1		65	2	30	3				219							
175/ 6E-25E 1 S	61	6.9	729	49	19	76	3	0	207	20	123	7.2	0.6	0	59	484	201						
4-28-64				2.45	1.56	3.30	0.08		3.39	0.42	3.47	0.12											
				33	21	45	1		46	6	47	2				459							
175/ 6E-33RS1 5	65	8.0	550	48	10	54	2	0	232	--	49	4.3	--	0.10	--		161						
10-24-52				2.40	0.82	2.35	0.05		3.80		1.38	0.07											
185/ 3E-24N 1 S	71	7.3	706	62	20	53	4	0	252	7	95	3.6	0.2	0.05	47	423	237						
7- 8-58				3.09	1.64	2.30	0.10		4.13	0.15	2.68	0.06											
				43	23	32	1		59	2	38	1				416							
185/ 3E-25G 2 S	--	8.4	606	2	2	144	--	--	223	22	75	3.3	0.3	0.05	--		13						
9-16-53				0.10	0.16	6.26			3.65	0.46	2.12	0.05				411							
				2	2	96			58	7	34	1				358							
185/ 3E-25G 3 S	--	7.6	657	60	19	46	4	0	243	22	79	1.6	0.3	0.05	42	412	228						
12-19-61				2.99	1.56	2.00	0.10		3.98	0.46	2.23	0.03											
				45	23	30	2		59	7	33					393							
185/ 4E-24G 1 S	--	7.5	430	20	15	47	3	0	171	19	39	3.5	0.4	0.04	47	270	112						
6-25-64				1.00	1.23	2.04	0.08		2.80	0.40	1.10	0.06											
				23	28	47	2		64	9	25	1				278							
185/ 5E- 18 1 S	--	7.2	398	23	11	42	2	0	156	7	44	2.0	0.4	0.08	45	255	103						
6-24-64				1.15	0.90	1.83	0.05		2.56	0.15	1.24	0.03											
				29	23	47	1		64	4	31	1				253							
185/ 5E- 1G 1 S	--	7.7	433	31	9	52	2	0	181	--	42	6.0	0.5	0.09	39	300	115						
8- 7-62				1.55	0.74	2.26	0.05		2.97		1.16	0.10											
185/ 5E- 9K 1 S	--	7.7	680	59	16	63	4	0	299	11	66	6.8	0.4	0.07	28	354	221						
8- 8-62				2.94	1.48	2.74	0.10		4.90	0.23	1.86	0.11											
				40	20	38	1		69	3	26	2				403							
185/ 5E-120 1 S	68	8.0	818	49	29	95	2	0	321	25	70	18	0.6	0.16	33	592	242						
7-21-58				2.45	2.38	4.13	0.05		5.26	0.52	1.97	0.29											
				27	26	46	1		65	6	25	4				480							
185/ 5E-16H 1 S	63	7.4	806	62	23	71	4	0	274	67	79	6	0.4	0.30	33	576	249						
7-18-58				3.09	1.89	3.09	0.10		4.49	1.39	2.23	0.10											
				38	23	38	1		55	17	27	1				480							
185/ 6E-12P 1 S	--	8.2	642	50	12	72	3	0	234	16	83	4.5	0.7	0.08	52	410	175						
6-26-64				2.50	0.99	3.13	0.08		3.84	0.33	2.34	0.07											
				37	15	47	1		58	5	36	1				408							



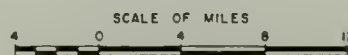
KEY MAP

LEGEND

- DRAINAGE PROVINCE BOUNDARY
- HYDROLOGIC UNIT BOUNDARY
- HYDROLOGIC SUBUNIT BOUNDARY
- 4.00 SEE NAMES AND AREAL CODE NUMBERS FOR COMPLETE DESIGNATION.

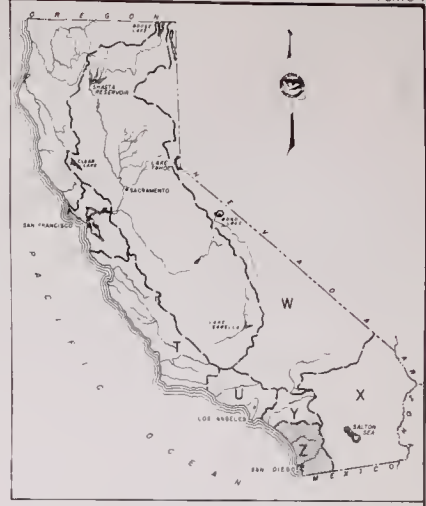
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LOCATION OF HYDROLOGIC
BOUNDARIES



NAMES AND AREAL CODE NUMBERS
SAN DIEGO REGION

Code	Designation
Z-01.00	San Juan Hydrologic Unit
Z-01.A0	Laguna Hydrologic Subunit
Z-01.B0	San Juan Hydrologic Subunit
Z-01.C0	San Clemente Hydrologic Subunit
Z-01.D0	San Mateo Hydrologic Subunit
Z-01.E0	San Onofre Hydrologic Subunit
Z-02.00	Santa Margarita Hydrologic Unit
Z-02.A0	Ysidora Hydrologic Subunit
Z-02.B0	De Luz Hydrologic Subunit
Z-02.C0	Murietta Hydrologic Subunit
Z-02.D0	Auld Hydrologic Subunit
Z-02.E0	Pechanga Hydrologic Subunit
Z-02.F0	Wilson Hydrologic Subunit
Z-02.G0	Anza Hydrologic Subunit
Z-02.H0	Aguanga Hydrologic Subunit
Z-02.I0	Oak Grove Hydrologic Subunit
Z-03.00	San Luis Rey Hydrologic Unit
Z-03.A0	Bonsall Hydrologic Subunit
Z-03.B0	Munserate Hydrologic Subunit
Z-03.C0	Warner Hydrologic Subunit
Z-04.00	Carlsbad Hydrologic Unit
Z-04.A0	Loma Alta Hydrologic Subunit
Z-04.B0	Vista Hydrologic Subunit
Z-04.C0	Agua Hedionda Hydrologic Subunit
Z-04.D0	Encinas Hydrologic Subunit
Z-04.E0	San Marcos Hydrologic Subunit
Z-04.F0	Escondido Hydrologic Subunit
Z-05.00	San Diego Hydrologic Unit
Z-05.A0	San Diego Hydrologic Subunit
Z-05.B0	Hodges Hydrologic Subunit
Z-05.C0	San Pascual Hydrologic Subunit
Z-05.D0	Santa Maria Valley Hydrologic Subunit
Z-05.E0	Santa Ysabel Hydrologic Subunit
Z-06.00	Penasquitos Hydrologic Unit
Z-06.A0	Soledad Hydrologic Subunit
Z-06.B0	Poway Hydrologic Subunit
Z-06.C0	Scripps Hydrologic Subunit
Z-06.D0	Miramar Hydrologic Subunit
Z-06.E0	Tecolote Hydrologic Subunit
Z-07.00	San Diego Hydrologic Unit
Z-07.A0	Lower San Diego Hydrologic Subunit
Z-07.B0	San Vicente Hydrologic Subunit
Z-07.C0	El Capitan Hydrologic Subunit
Z-07.D0	Cuyamaca Hydrologic Subunit
Z-08.00	Coronado Hydrologic Unit
Z-08.A0	Point Loma Hydrologic Subunit
Z-08.B0	San Diego Mesa Hydrologic Subunit
Z-08.C0	Paradise Hydrologic Subunit
Z-09.00	Sweetwater Hydrologic Unit
Z-09.A0	Lower Sweetwater Hydrologic Subunit
Z-09.B0	Middle Sweetwater Hydrologic Subunit
Z-09.C0	Upper Sweetwater Hydrologic Subunit
Z-10.00	Otay Hydrologic Unit
Z-10.A0	Coronado Hydrologic Subunit
Z-10.B0	Otay Hydrologic Subunit
Z-10.C0	Dulzura Hydrologic Subunit
Z-11.00	Tijuana Hydrologic Unit
Z-11.A0	Tia Juana Hydrologic Subunit
Z-11.B0	Potrero Hydrologic Subunit
Z-11.C0	Barritt Lake Hydrologic Subunit
Z-11.D0	Mountain Hydrologic Subunit
Z-11.E0	Morena Hydrologic Subunit
Z-11.F0	Cottonwood Hydrologic Subunit
Z-11.G0	Cameron Hydrologic Subunit
Z-11.H0	Campo Hydrologic Subunit

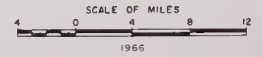


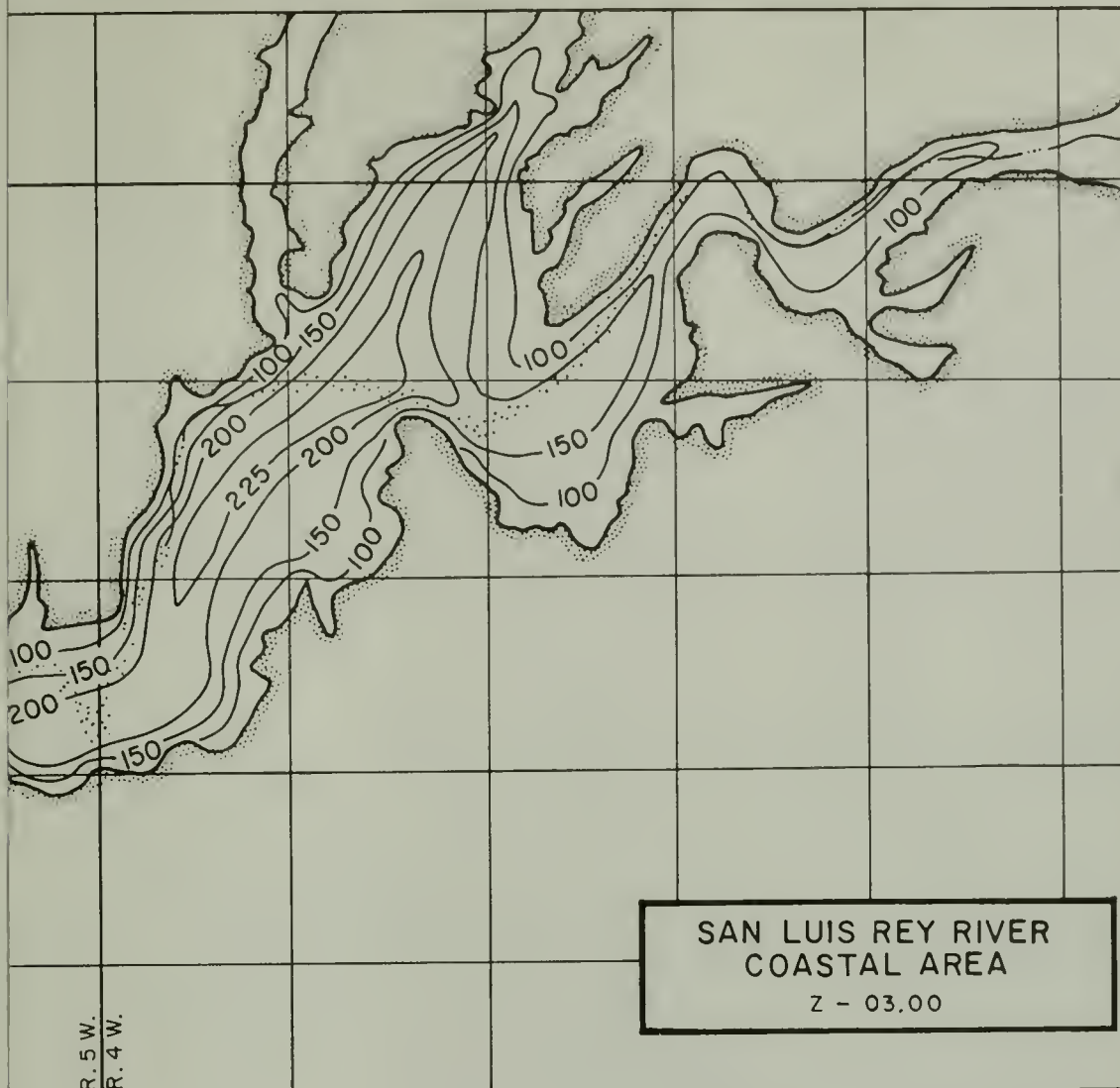
KEY MAP

- LEGEND
- DRAINAGE PROVINCE BOUNDARY
 - HYDROLOGIC UNIT BOUNDARY
 - HYDROLOGIC-SUBUNIT BOUNDARY
 - 4.00 SEE NAMES AND AREAL CODE NUMBERS FOR COMPLETE DESIGNATION.

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SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

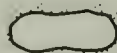
LOCATION OF HYDROLOGIC BOUNDARIES





LEGEND

— 100 — LINE OF EQUAL THICKNESS OF VALLEY FILL



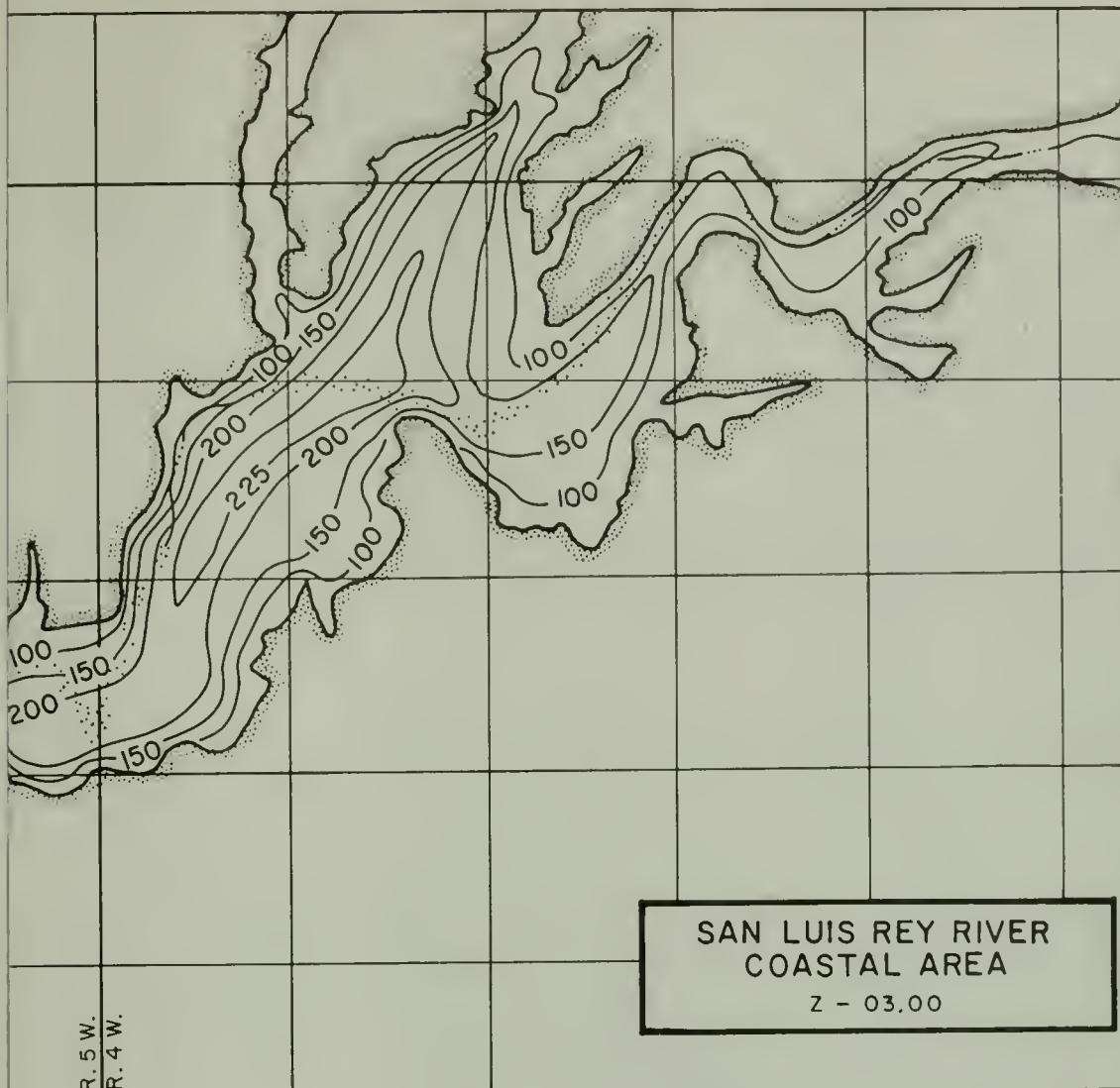
BOUNDARY OF VALLEY FILL AREA

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THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

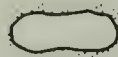
SCALE OF MILES





LEGEND

— 100 — LINE OF EQUAL THICKNESS OF VALLEY FILL



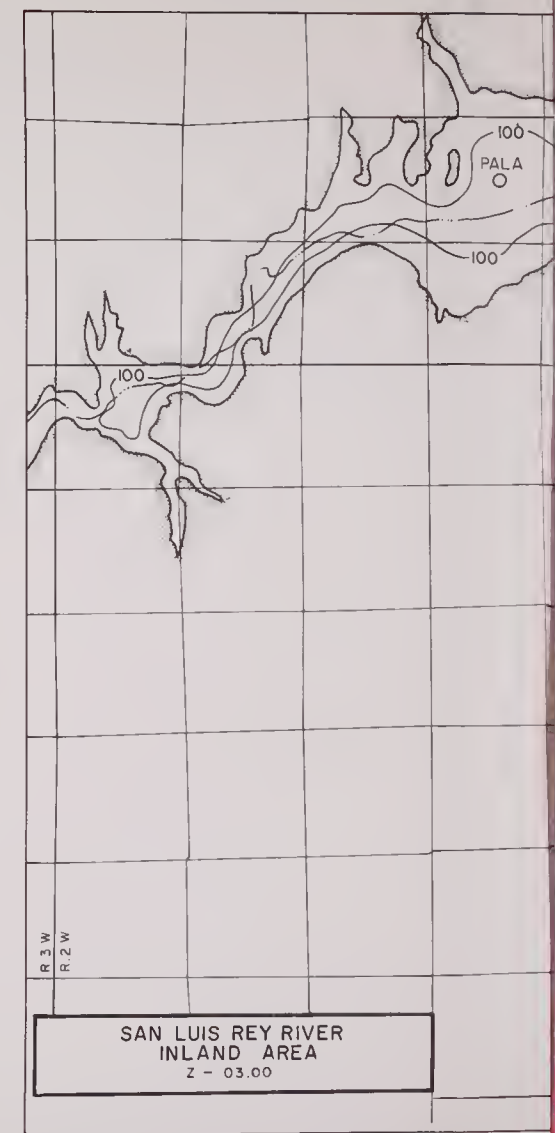
BOUNDARY OF VALLEY FILL AREA

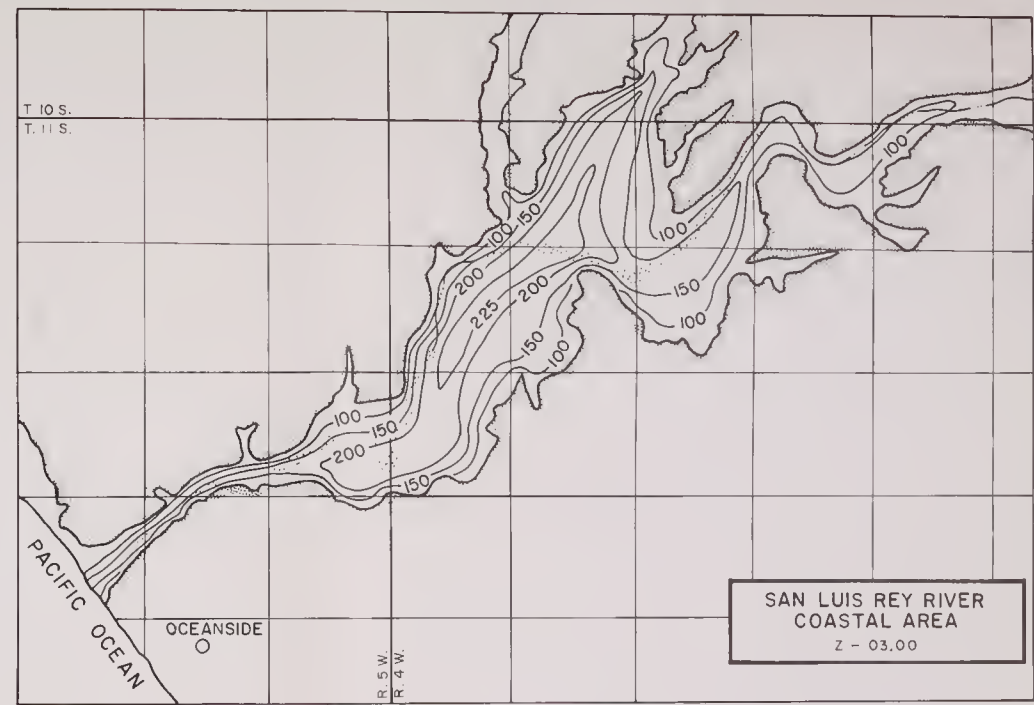
STATE OF CALIFORNIA
THE RESOURCES AGENCY
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SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

— ◆ —
LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES







SAN LUIS REY RIVER
COASTAL AREA
Z - 03.00

LEGEND

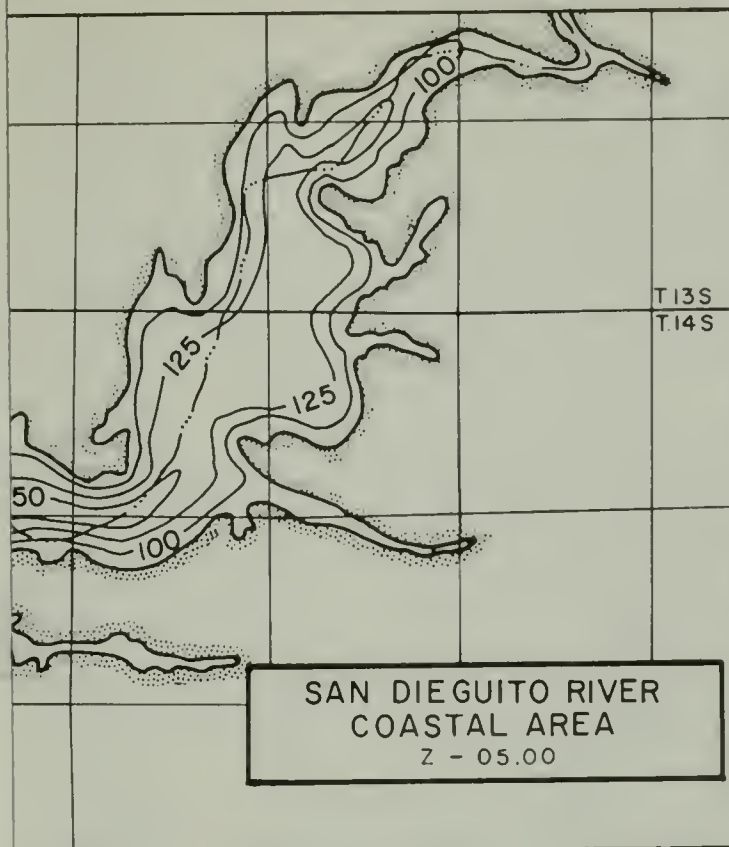
- 100 — LINE OF EQUAL THICKNESS OF VALLEY FILL
- BOUNDARY OF VALLEY FILL AREA



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SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS





LEGEND

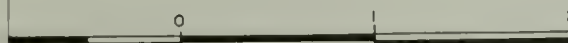
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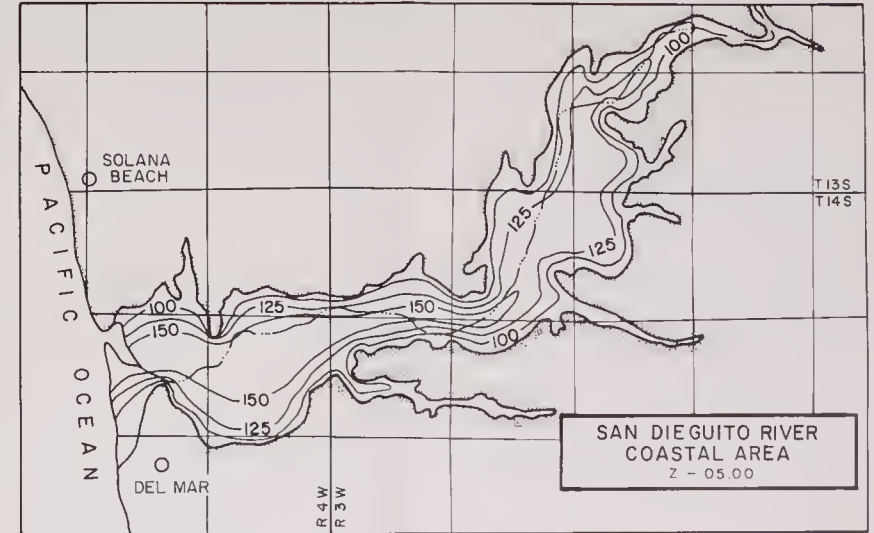
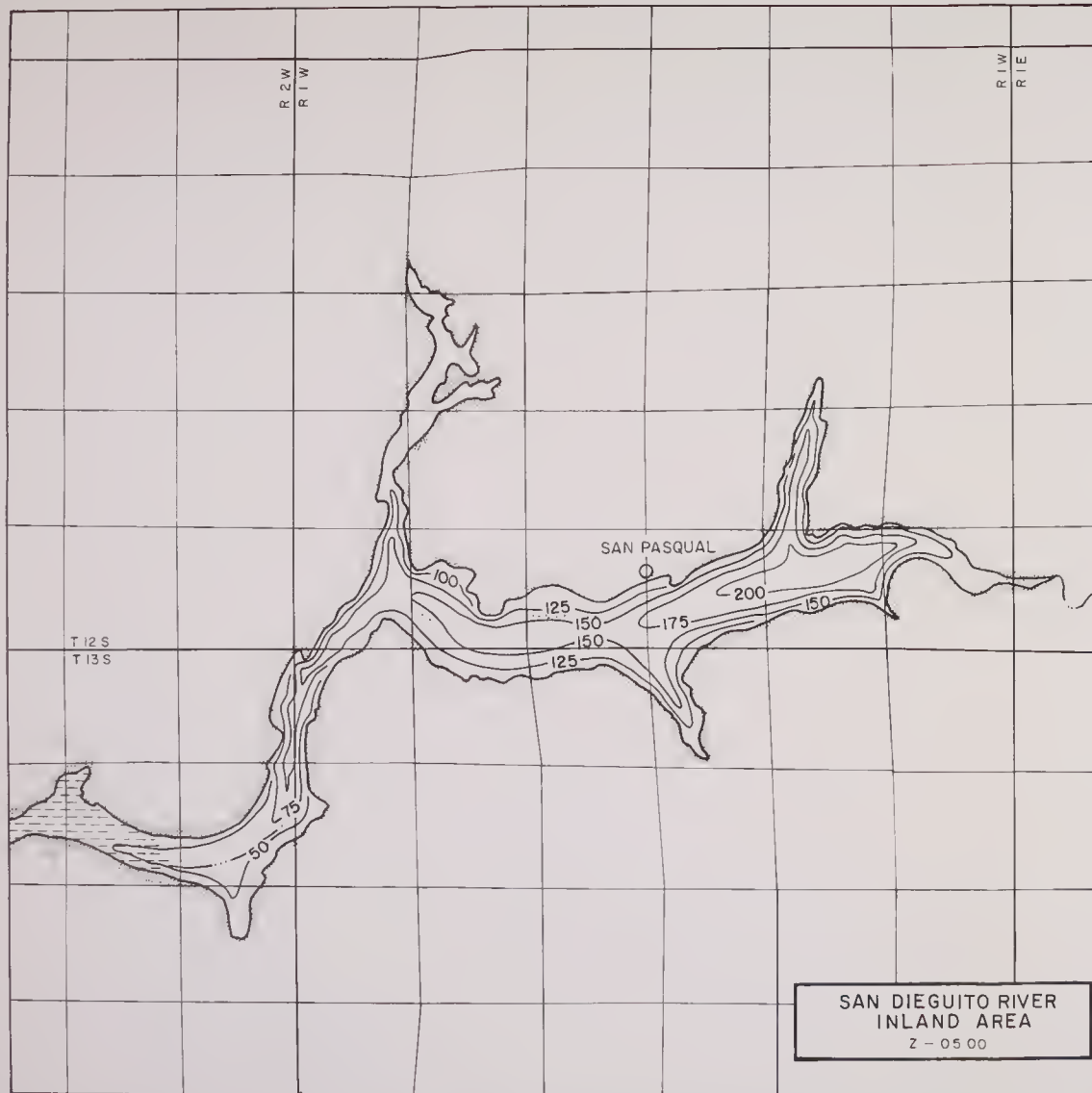
 BOUNDARY OF VALLEY FILL AREA

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THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES





LEGEND

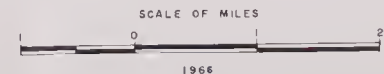
— 125 — LINE OF EQUAL THICKNESS OF VALLEY FILL

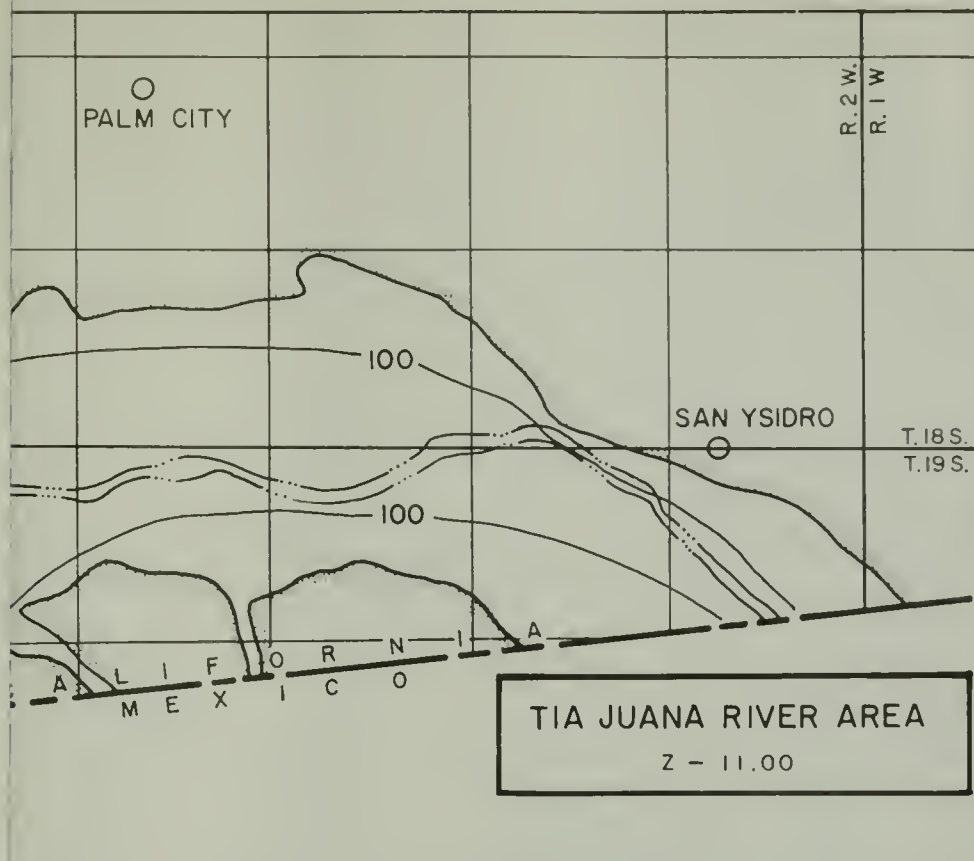
○ BOUNDARY OF VALLEY FILL AREA



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DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

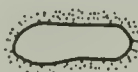
LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS





LEGEND

— 75 — LINE OF EQUAL THICKNESS OF VALLEY FILL

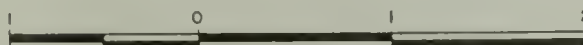


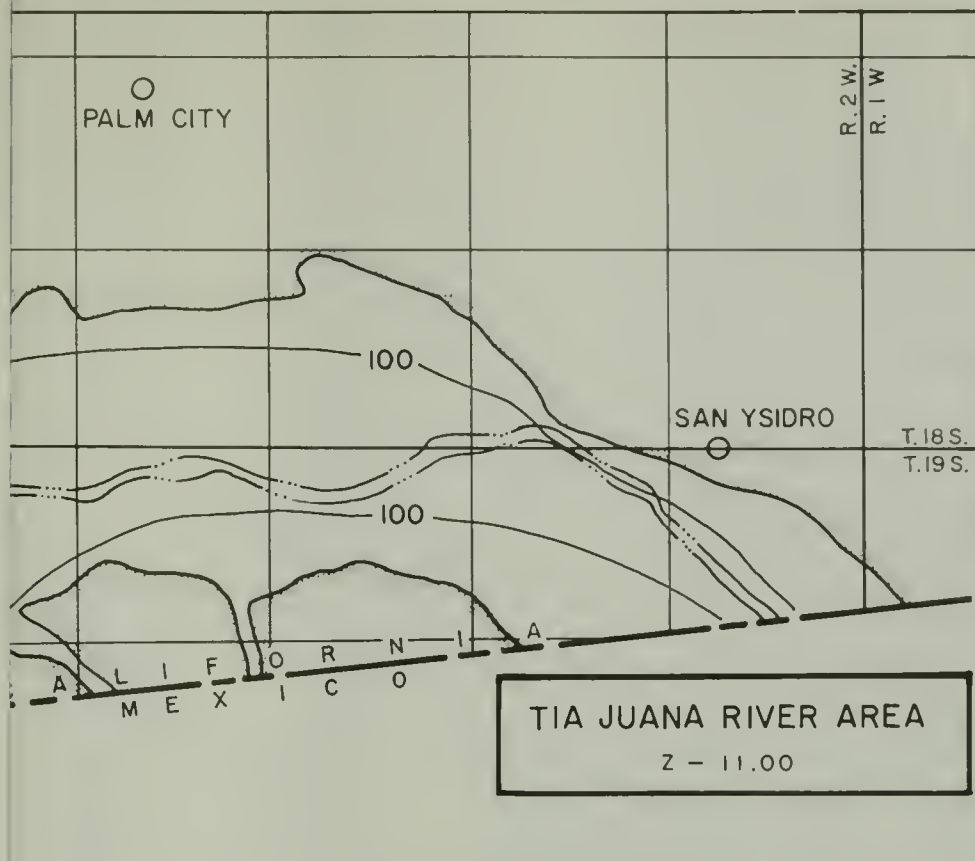
BOUNDARY OF VALLEY FILL AREA

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SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

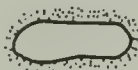
SCALE OF MILES





LEGEND

— 75 — LINE OF EQUAL THICKNESS OF VALLEY FILL

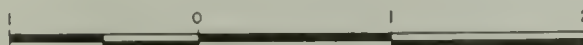


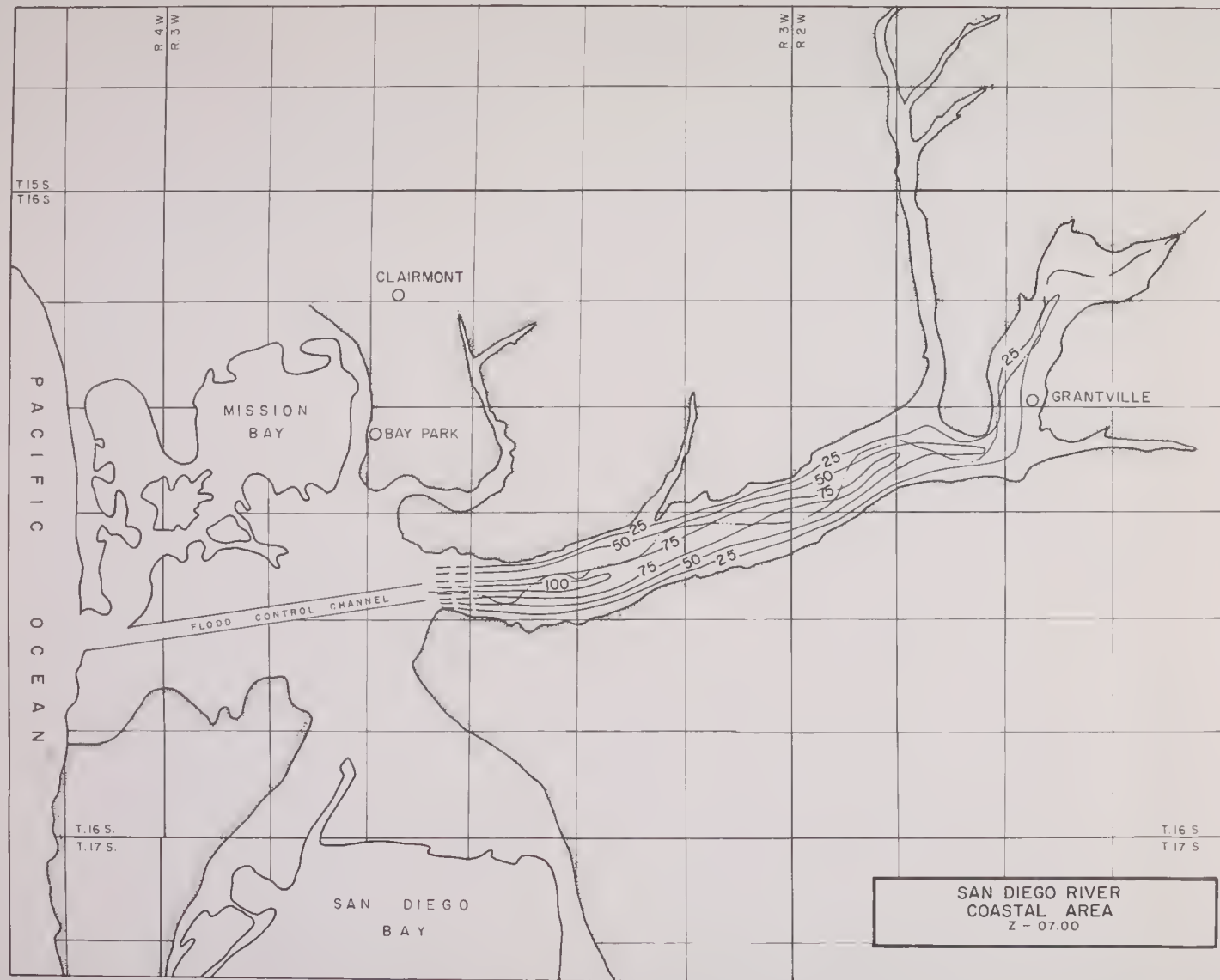
BOUNDARY OF VALLEY FILL AREA

STATE OF CALIFORNIA
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DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

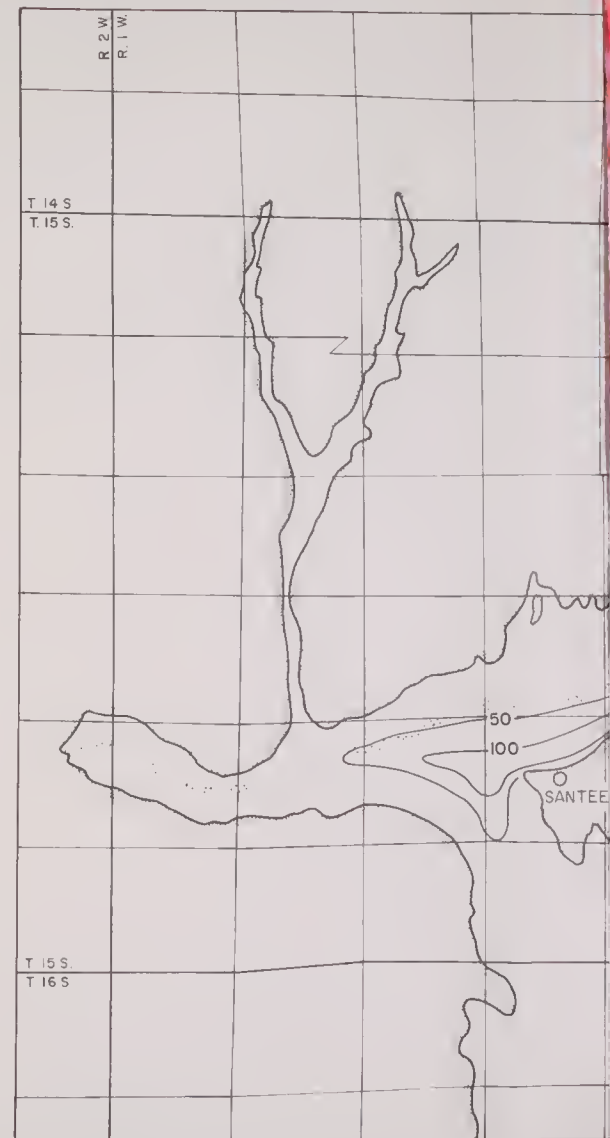
LINES OF EQUAL THICKNESS OF VALLEY FILL
IN SELECTED AREAS

SCALE OF MILES





SAN DIEGO RIVER
COASTAL AREA
Z - 07.00





KEY MAP

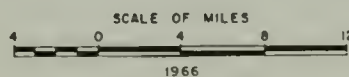
LEGEND

- DRAINAGE PROVINCE BOUNDARY
- HYDROLOGIC UNIT BOUNDARY
- 20— LINE OF EQUAL MEAN PRECIPITATION IN INCHES

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

—◆—
LINES OF EQUAL MEAN
ANNUAL PRECIPITATION
1897-98 THROUGH 1946-47





KEY MAP

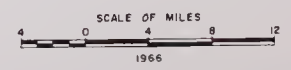
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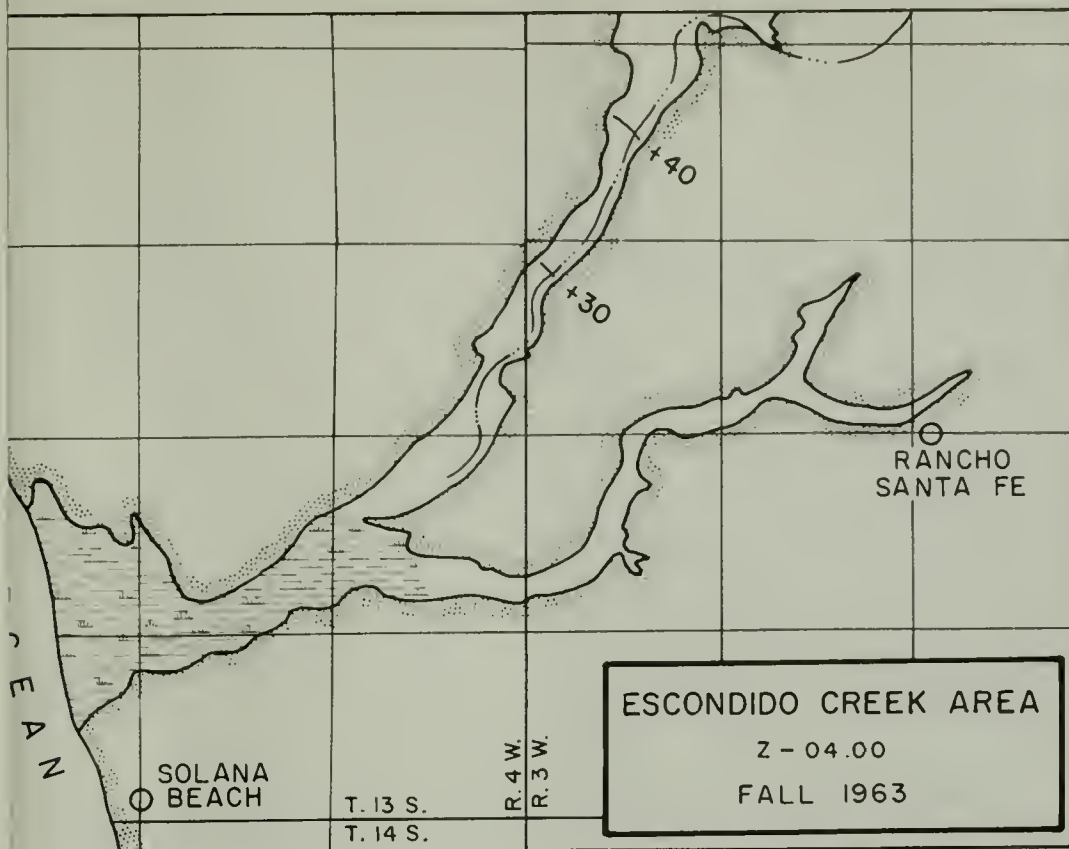
- ORAINAGE PROVINCE BOUNDARY
- HYDROLOGIC UNIT BOUNDARY
- 20— LINE OF EQUAL MEAN PRECIPITATION IN INCHES

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

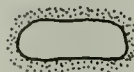
LINES OF EQUAL MEAN
ANNUAL PRECIPITATION
1897-98 THROUGH 1946-47





LEGEND

— +40 — LINE OF EQUAL ELEVATION OF WATER IN WELLS IN ALLUVIUM (QAL)



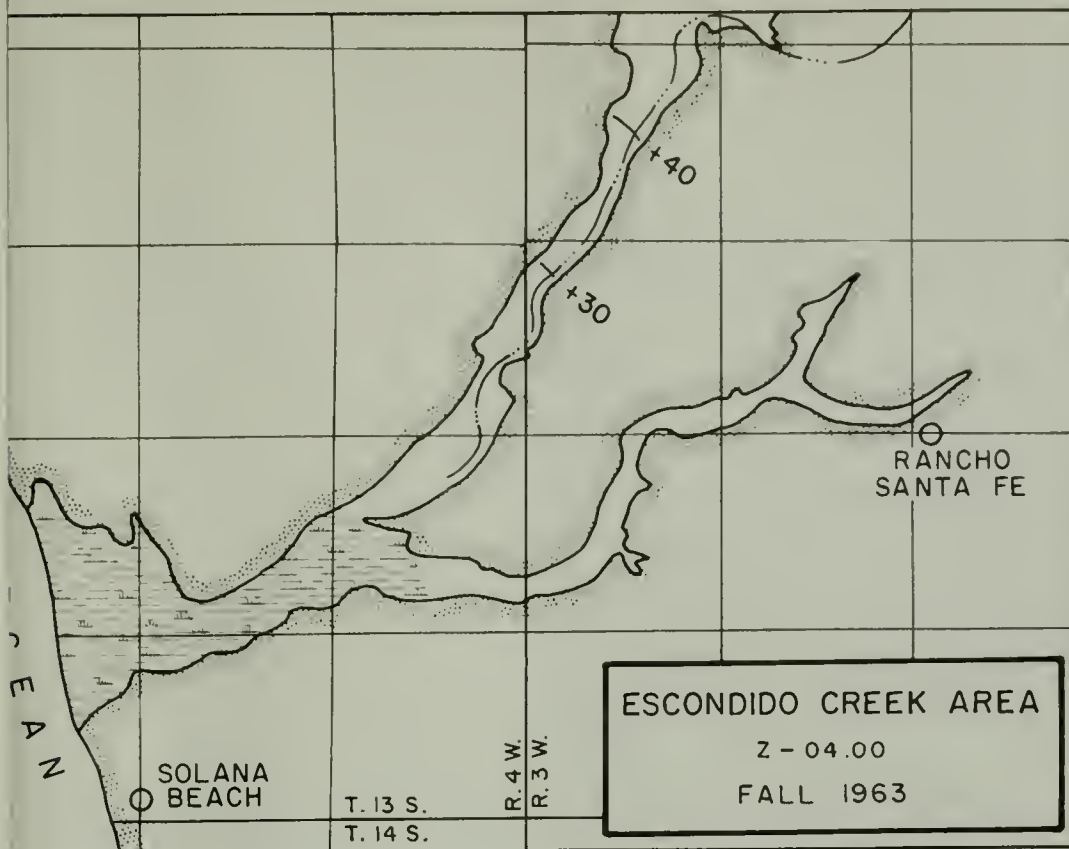
BOUNDARY OF VALLEY FILL AREA

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL ELEVATION OF WATER
IN WELLS IN SELECTED AREAS

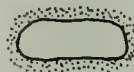
SCALE OF MILES





LEGEND

— +40 — LINE OF EQUAL ELEVATION OF WATER IN WELLS IN ALLUVIUM (OAL)



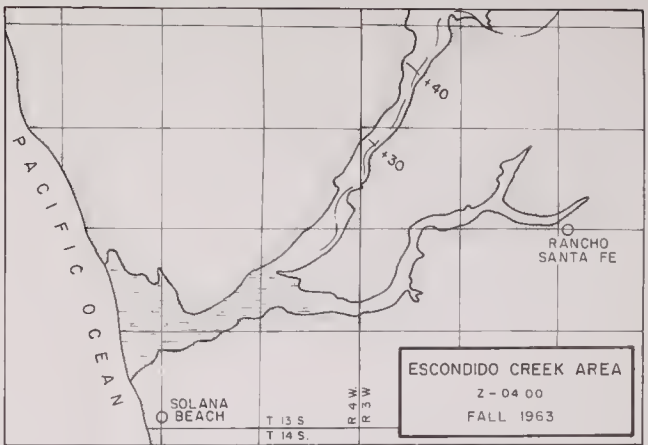
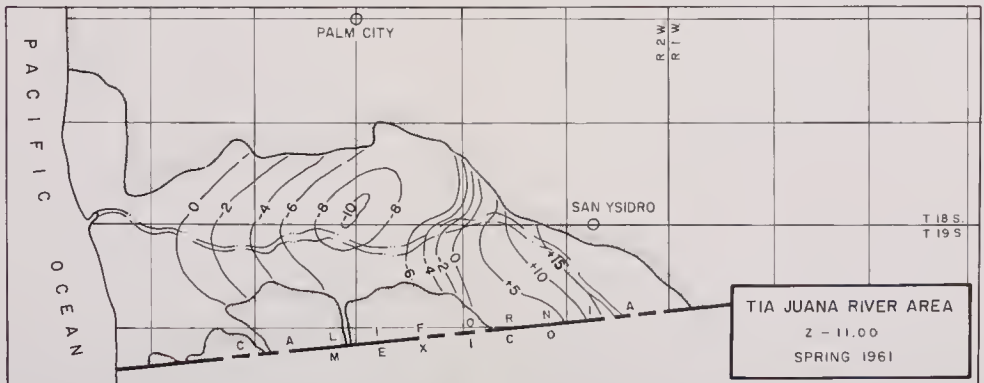
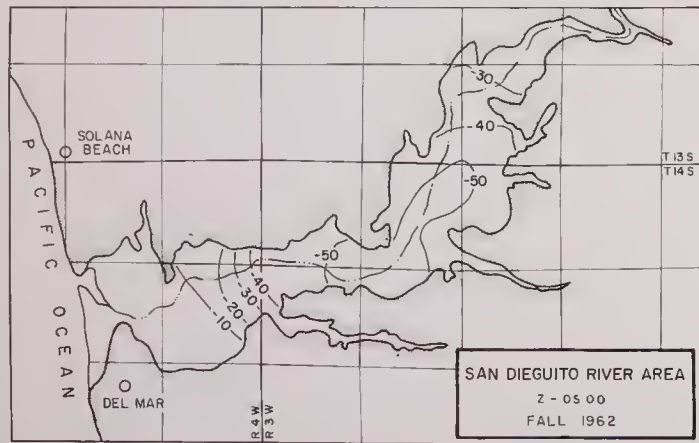
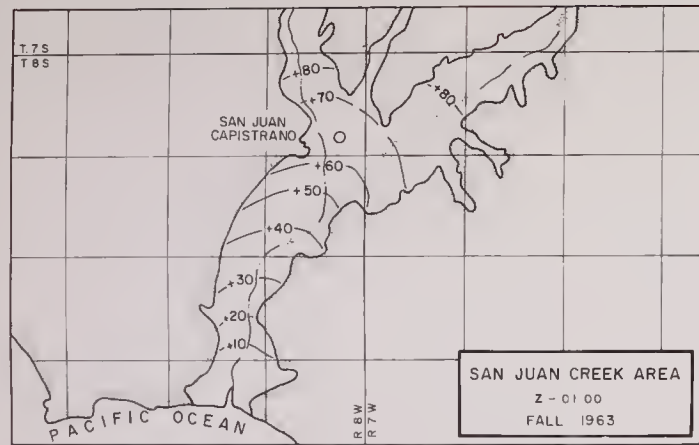
BOUNDARY OF VALLEY FILL AREA

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

— ◆ —
LINES OF EQUAL ELEVATION OF WATER
IN WELLS IN SELECTED AREAS

SCALE OF MILES





— +40 — LINE OF EQUAL ELEVATION OF WATER IN WELLS IN ALLUVIUM (QAL)

BOUNDARY OF VALLEY FILL AREA



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

LINES OF EQUAL ELEVATION OF WATER
 IN WELLS IN SELECTED AREAS

SCALE OF MILES



1966



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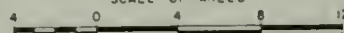
- DRAINAGE PROVINCE BOUNDARY
 --- HYDROLOGIC UNIT BOUNDARY
 S-1 ▲ STREAM SAMPLING STATION
 R-1 ● LAKE OR RESERVOIR SAMPLING STATION

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

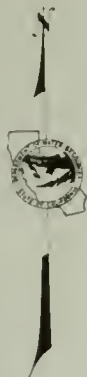
GROUND WATER OCCURRENCE AND QUALITY SAN DIEGO REGION

CHEMICAL QUALITY OF WATER IN SELECTED STREAMS, LAKES, AND RESERVOIRS

SCALE OF MILES



1966



KEY MAP



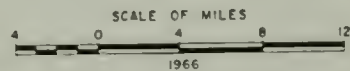
LEGEND

- ORAINAGE PROVINCE BOUNDARY
- HYDROLOGIC UNIT BOUNDARY
- S-1 ▲ STREAM SAMPLING STATION
- R-1 ● LAKE OR RESERVOIR SAMPLING STATION

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION





CHEMICAL QUALITY OF WATER IN
SELECTED STREAMS, LAKES, AND RESERVOIRS





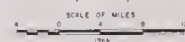
KEY MAP

LEGEND

-  DRAINAGE PROVINCE BOUNDARY
 HYDROLOGIC UNIT BOUNDARY
 STREAM SAMPLING STATION
 LAKE OR RESERVOIR SAMPLING STATION

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

GROUND WATER OCCURRENCE AND QUALITY
SAN DIEGO REGION

CHEMICAL QUALITY OF WATER IN
SELECTED STREAMS, LAKES, AND RESERVOIRS

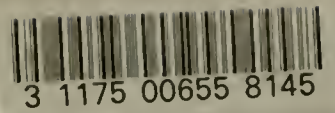
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